List of Appendices

Appendix A:
NHDES Dam Safety Correspondence

State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES
6 Hazen Drive, P.O. Box 95, Concord, NH 03302-0095
(603) 271-3406 FAX (603) 271-7894

December 10, 2002
Letter of Deficiency
DAM #071.03

Mr. Michael Lynch
Public Works Dept.
Town of Durham
100 Stone Quarry Drive
Durham, NH 03824

RE: Oyster River Dam, Durham

Dear Mr. Lynch:

The Department of Environmental Services, Dam Bureau (DES) consistently strives to enhance the safety of dams in New Hampshire through its dam safety program. One of the many instruments that play a part in reaching this goal is our inspection program. DES is forwarding this correspondence to you to advise you that in accordance with RSA 482:12 and Env-Wr 502.02, an inspection of the subject dam was conducted on October 9, 2002. During this visual inspection and/or file review, the following deficiencies were observed:

1. Deteriorated concrete was noted in the following locations (refer to enclosed sketch);
    a. The upper and lower portions of the eight concrete piers supporting the spillway slab;
    b. Along the base of the left abutment wall of the gate structure/right spillway training wall. Rebar was also exposed in this area;
    c. To the right of the low level gate at the base of the downstream face;
    d. On the interior ceiling of bay 8 (counting from right end). Rebar was also exposed;

2. Minor seepage was evident at the corner of the right masonry abutment wall. This wet area has been noted during past inspections;

3. The dam cannot pass the routed design storm with one foot of freeboard remaining on the dam;

4. The Emergency Action Plan (EAP) needs updating and testing; and

5. The Operation and Maintenance Plan (O&M) needs finalizing.

DES believes that the above deficiencies can be corrected by performing the following items by the indicated schedule:

January 30, 2003:

1. Finalize the O&M plan;

2. Update and test the EAP;

November 1, 2003:

3. Repair the deteriorated concrete noted in the following locations:
    a. The upper and lower portions of the eight concrete piers supporting the spillway slab;
    b. Along the base of the left abutment wall of the gate structure/right spillway training wall. Rebar was also exposed in this area;
    c. To the right of the low level gate at the base of the downstream face;
    d. On the interior ceiling of bay 8 (counting from right end). Rebar was also exposed;

4. Conduct a stability analysis to verify that the dam is stable under the design storm conditions (100-year storm with one foot overtopping dam);

On a Continuing Basis:

5. Monitor the minor seepage, which is evident at the corner of the right masonry abutment wall.

Due to the time that has lapsed as well as additional deficiencies observed as a result of the October 9, 2002 inspection, DES will be officially closing out the 1999 LOD. Enclosed is a copy for your reference. It is our hope that the additional deficiencies as well as the outstanding deficiency will be addressed within the schedule indicated above.

DES is requesting that you complete and submit the attached "Intent to Complete Repairs" form, within 30 days of receipt of this letter, that will provide for correction of the identified deficiencies by the date(s) indicated above. If you believe changes to the items of work or dates are necessary, please make the changes directly on the form and provide a brief explanation. We have enclosed a self addressed stamped envelope for you to return this form.

Our intent in sending you this correspondence is to make you aware of items that DES believes warrant your attention to insure the continued safe operation of your dam. It is our hope that, through the submittal of the attached form and a commitment to keeping a well-maintained dam, you will voluntarily comply with the requested items of work. If we do not receive the intent form or a similarly adequate written reply, we will assume that you are in agreement with our findings and recommendations and DES will carry out follow-up inspections accordingly.

If you have any questions or comments regarding this Letter of Deficiency or would like to be present at future inspections, please contact me at 271-3406, or write to the Water Division at the address listed on the top of the previous page.

Sincerely,

Grace Levergood

Grace E. Levergood, P.E.
Dam Safety Engineer

Attachments Guideline for an O&M plan, Copy of 1999 LOD, DB13
cc: Gretchen Rule
Certified #7000 1670 0000 0586 1100
GEL/was/h:/safety/wendy/lod/071-03lod.doc

NHDES

The State of New Hampshire

DEPARTMENT OF ENVIRONMENTAL SERVICES

Thomas S. Burack, Commissioner

1776

October 11, 2010

Mr. Michael Lynch
Public Works Department
Town of Durham
100 Stone Quarry Drive
Durham, NH 03824

RE: Mill Pond Dam
NH Dam # 071.03, Durham, NH

Dear Dam Owner:

The Department of Environmental Services (DES) is writing to formally follow-up on verbal discussions with Mr. David Cedarholm regarding the Oyster River Dam (Mill Pond Dam) this past spring. In the flooding events of the spring of 2010, the dam sustained damage to the right abutment due to overtopping flows resultant from the limited discharge capacity of the dam. The dam was modified by the owner of the right abutment in the recent past, without permit, and it is that construction, at the block granite wall, which sustained the bulk of the damage.

It was requested, verbally, in the spring, that Mr. Cedarholm meet with the Town's consultant, Stevens Associates, relative to designing a temporary repair to the structure until the Town makes a decision as to whether the dam will be reconstructed or removed. To date, it appears that no action has occurred in regard to designing or implementing a repair to the structure.

In speaking with Mr. Cedarholm on October 6, 2010, it appears that there is a legal question relative to the extent of ownership of the dam, and that the Town cannot work on the private property at the right end of the dam.

As the dam does not meet appropriate discharge capacity requirements, and because overtopping of the right abutment continues to occur with relative frequency, the erosion damage that exists in that area can be expected to worsen significantly with each occurrence.. Ultimately, dam failure at the right abutment will occur. As such, it is suggested that you design and construct, in the next few months, a repair that withstands the rigors of the expected overtopping or implement some other solution that reduces the risk of overtopping and further damage while the fate of the dam is determined. This latter option will likely have to be accompanied by a full and indefinite drawdown of the impoundment to provide the greatest amount of storage available. In either case, this issue should be addressed as soon as possible, and certainly before temperatures prevent competent earthwork from occurring. Please note that neither of these options are viable long-term solutions, but only interim measures to reduce potential damage to and failure of the dam until the Town can formally decide what it will do with the dam.

Mr. Cedarholm has been coordinating long-term concrete testing with Dr. Gress, of UNH, and DES has allowed the timetable to be extended so that his results can be quantified and processed by all involved. DES expects that these results can be quantified, and the Town can make a decision relative to the fate of the dam, by October 15, 2011.

DES Web site: **www.des.nh.gov**
P.O. Box 95, 29 Hazen Drive, Concord, New Hampshire 03302-0095
Telephone: (603) 271-3406 • Fax: (603) 271-7894 • TDD Access: Relay NH 1-800-735-2964

Steve Doyon and I are looking forward to our meeting with you, Mr. Cedarholm and Jae Whitelaw on Friday here at DES. It is our hope that an appropriate interim solution can be found at this meeting. If you have any questions you may contact me at 271-3406 or write to the Water Division at the address listed at the bottom of the previous page.

Sincerely,

Brian A. Desfosses, P.E.
Dam Safety Engineer, Dam Bureau

ec: Mr. James W. Gallagher, Jr., P.E., Chief Engineer, Dam Bureau
Mr. Steve N. Doyon, P.E., Administrator, Dam Safety and Inspections Section, Dam Bureau
Mrs. Deb Loiselle, River Restoration Coordinator, Dam Bureau

cc: Town Council, Town of Durham, NH, Town Hall, 15 Newmarket Road, Durham, NH 03824
Todd Selig, Town Administrator, Town Hall, 15 Newmarket Road, Durham, NH 03824
Mr. Steve Burns & Mrs. Andrea Bodo, 20 Newmarket Road, Durham, NH 03824

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NHDES

The State of New Hampshire

DEPARTMENT OF ENVIRONMENTAL SERVICES

Robert R. Scott, Commissioner

Ms. April Talon
Town Engineer
Town of Durham
100 Stone Quarry Drive
Durham, NH 03824

February 12, 2018
Letter of Deficiency
DSP #18-010

RE: Mill Pond Dam #D071003, Durham

Dear Ms. Talon:

The New Hampshire Department of Environmental Services, Dam Bureau (NHDES) is responsible for ensuring the safety of dams in New Hampshire through its dam safety program. In accordance with RSA 482:12 and Env-Wr 302.02, an inspection of the subject dam was conducted on December 8, 2017. Based upon the results of that inspection, NHDES is issuing this Letter of Deficiency (LOD) to advise you that it believes the following deficiencies can be remedied in accordance with the deadlines indicated:

By May 1, 2018:

1. Perform a baseline inspection of the entire structure, including the interior of all cells below the spillway and the exterior of the right abutment and gate structure. The inspection should include detailed descriptions and measurements of all cracks, spalls, deteriorated concrete, exposed rebar, etc. to fully characterize the dam's current condition. Representative photos should be taken. NHDES's most recent inspection revealed many visual deficiencies that are, or may be, indicators of more significant issues related to structure integrity and overall dam stability. Such things as widespread and significant concrete deterioration, multiple cracks/voids and leakage are some of the indicators in the cells below the spillway (see photos A, B, C, D, E, F, and G for typical examples) and on the right abutment wall housing the gates (see photos I, J, and K for typical examples). Several areas of deterioration have visibly increased since the 2008 inspection performed by Stephens Associates Consulting Engineers. Submit to NHDES the findings of the baseline inspection along with photos of items inspected.

2. Update NHDES with intentions on proceeding with reconstruction of the dam. The 2008 Stephens Associates Consulting Engineers Dam Evaluation Report and the 2011 Dr. David Gress report on concrete expansion at the dam, both indicate that due to continued concrete deterioration the dam will need to be repaired in the near future. Also previous hydraulic and hydrologic analyses, as supported by several overtopping events, indicate that the dam lacks adequate discharge capacity during the 50 year event. Current regulations require that a minimum of 1 foot of freeboard is required for Low hazard structures as outlined in Env-Wr 303.11.

3. Update the 2008 Operation, Maintenance and Response form (OMR) to include current emergency contact information and any other updated information. Further,

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the OMR should include provisions for a detailed biannual inspection to review and update the findings of the baseline inspection conducted as part of item #1, above. A link to the current OMR template may be found on DES's website on the Dam Bureau page.

By December 1, 2018:

4. Remove the trees and brush in the following locations. All trees and brush should be removed from the footprint of the dam and for a distance of 15 feet beyond the footprint of the dam and establish a hardy grass cover on all portions of the embankment that are not protected by other erosion resistant materials (i.e. rip rap, gravel road on crest, etc.).
    a. Within 15 feet of the fish ladder and the left abutment. (See photos L, M and N); and
    b. Within 15 feet of the downstream side of the right abutment and along the downstream right training/retaining wall. (See photos O and P). The large mature tree should also be removed to limit further deterioration of the wall.

5. Reseal the vertical joints at the following locations to limit water infiltration into the joints.
    a. Along the fish ladder. (See photo Q for a typical example); and
    b. Along the joint between the right end of the spillway and the adjacent right concrete abutment/gate structure. (See photos C and R).

By December 1, 2019:

6. Submit all necessary environmental permit applications (dam reconstruction and dredge and fill) for reconstruction of the dam. This application should be prepared by a qualified consultant familiar with dams and include a design of the dam that allows for the passage of the required design storm as well as all other applicable provisions of Env-Wr 400.

By December 1, 2020:

7. Complete the reconstruction of the dam and downstream areas as necessary in accordance with any permits issued as part of item# 6.

NHDES did not complete an assessment of either the hydrology of the contributing watershed or the hydraulic capacity of your dam as part of the most recent inspection. Further, no effort was made to review the areas downstream of the dam in order to reassess the dam's current hazard classification. These analyses are performed less frequently, but will be conducted as part of a future inspection of your dam. The findings related to these more detailed analyses could result in the need to complete additional and/or more extensive repairs than those identified above. Should you consider performing modifications to spillways or other outlet works, or work that otherwise meets the definition of "reconstruction" (see below), then a more in-depth analysis of the dam related to its watershed, structural characteristics and hazard classification must be completed to assure that modifications are made that meet the design requirements consistent with an up to date hazard assessment.

RSA 482:2X. "Reconstruction" means:
(a) A change in the height, length, or discharge capacity of the structure;
(b) Restoring a breached dam or one in ruins;
(c) Modification of flashboards which either increases their height or increases the headwater elevation at which the flashboards will fail; or
(d) A change in the structural configuration of a dam

Please note that under New Hampshire's state statute RSA 482:89, NHDES may commence proceedings to levy fines of up to $2,000 per violation per day against a dam owner who does not respond within 45 days of receipt of a written order, directive, or any notice of needed maintenance, repair, or reconstruction issued by NHDES. To avoid proceedings under this provision, you **must** **respond** to this LOD. If you fail to return this form within 45 days or fail to otherwise respond in writing within 45 days indicating your intent to remedy the identified deficiencies, you will not have the benefit of the compliance deadlines indicated on the form and NHDES will commence a proceeding under RSA 482:89 to seek administrative fines for the identified deficiencies. Please note that responding as required does not preclude NHDES from pursuing other appropriate action for the identified deficiencies, in accordance with NHDES Compliance Assurance Response Policy, available on-line at http://des.nh.gov/organization/commissioner/legal/carp/index.htm.

We believe the easiest way to respond is to sign and return the attached "Intent to Complete Repairs" form, either agreeing to correct the identified deficiencies by the dates indicated OR by proposing amendments to the listed work items or dates, which you may do by writing directly on the form. NHDES will evaluate and respond to any reasonable requests for proposed amendments in a timely manner. We have enclosed a self-addressed stamped envelope for you to return this form. You may also scan and e-mail the completed form to damsafety@des.nh.gov or fax it to (603) 271-6120.

Our intent in issuing this LOD is to make you aware of items that require your attention to ensure the continued safe operation of your dam. It is our hope that, through the return of the attached form and correction of the identified deficiencies, you will develop and maintain a commitment to keeping a safe and well-maintained dam.

If you have any questions or comments regarding this LOD or would like to be present at future inspections, please contact Corey Clark, P.E. at 271-7507 or me at 271-3406 or write to the address for the Water Division listed on the bottom of the cover page.

Sincerely,

Steve N. Doyon, PE
Administrator
Dam Safety & Inspection Section

Attachments: Photos, Copy of 2008 OMR, Blank OMR form, DB8, DB13
cc: NHDES Legal Unit
Certified #7016 1970 0000 4865 7645

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DAM #D071003, MILL POND DAM, DURHAM, INSPECTED DECEMBER 8, 2017

A

B

C

D

DAM #D071003, MILL POND DAM, DURHAM, INSPECTED DECEMBER 8, 2017

E

F

G

H

DAM #D071003, MILL POND DAM, DURHAM, INSPECTED DECEMBER 8, 2017

I

J

K

L

DAM #D071003, MILL POND DAM, DURHAM, INSPECTED DECEMBER 8, 2017

M

N

O

P

DAM #D071003, MILL POND DAM, DURHAM, INSPECTED DECEMBER 8, 2017

Q

R

NHDES

The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES

Robert R. Scott, Commissioner

February 12, 2018
Letter of Closure
For
Letter of Deficiency

Ms. April Talon
Town Engineer
Town of Durham
100 Stone Quarry Drive
Durham, NH 03824

RE: Mill Pond Dam #D071003 in Durham
Letter of Deficiency (LOD) DAM #D071003
Issued on December 10, 2002

Dear Ms. Talon:

Based on a file review and a scheduled inspection conducted on December 8, 2017, of the above referenced dam, the New Hampshire Department of Environmental Services, Dam Bureau (NHDES) has determined that full compliance has not been achieved for the above referenced LOD. The December 2002 LOD has been officially closed. Please refer to the new LOD #18-010 enclosed that incorporates any outstanding deficiencies as they relate to the December 2010 LOD, as well as any new deficiencies that were found as the result of this most recent file review and site assessment.

If you have any questions or comments, please contact Corey Clark, P.E. at 271-7507 or me at 271-3406, or write to the Water Division at the address listed below.

Sincerely,

Steve N. Doyon, P.E.
Administrator
Dam Safety & Inspection Section

Enclosure: Copy of December 10, 2002 LOD
cc: NHDES Legal Unit

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The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES

Robert R. Scott, Commissioner

September 20, 2018

Ms. April Talon, Town Engineer
Durham Public Works
100 Stone Quarry Drive
Durham, NH 03824

RE: Mill Pond Dam – D071003, Hazard Classification Assessment

Dear Ms. Talon;

In response to our meeting held at your office on August 6th to discuss the above referenced dam, the New Hampshire Department of Environmental Services, Dam Bureau (NHDES), is providing the following recommendations for assessing the potential effects associated with the failure of the dam so that the appropriate design requirements for the dam can be established.

NHDES assigns hazard classifications, primarily, based upon the potential impacts that dam failure may have on adjacent or downstream properties. In addition, any dam whose height and maximum storage exceed both 6 feet and 50 acre-feet, respectively, is assigned a minimum classification of "Low". For these 6/50 cases, if dam failure is not expected to result in damages to property, lives or structures, then NHDES treats them as Non-Menace dams from an inspection and maintenance standpoint. That is, we still inspect them on a 6-year schedule and require that annual dam registration fees be paid, but no requirements related to performing repairs or maintenance are imposed. There are other factors related to the impoundment of water supply sources or liquid waste that could affect hazard classification, but these do not apply in the case of the Mill Pond Dam.

In the case of the Mill Pond Dam, the current hazard classification of "Low" relates to not only to the 6/50 criteria noted above, but also because of the potential for damages to occur to the property at the dam's right (as looking downstream) abutment. It is obvious that failure of the right abutment area will cause significant erosion damage to this property, as evidenced by previous dam overtopping events that have caused similar damage. Due to the height and configuration of the NH Route 108 crossing located immediately downstream, along with the ample storage provided in the tidal area further downstream, NHDES does not believe that the crossing or any properties downstream of it will be affected. Further, though damages to the wooden pedestrian bridge just downstream of the 108 crossing could occur, because it is municipally owned (like the dam) and its use is transient, NHDES has not considered it in assigning the hazard classification. Therefore, at least at the present time, the sole area of potential damage due to failure or misoperation of the dam relates to the property at the dam's right abutment. As noted, damage to the area immediately adjacent to the abutment as a consequence of dam failure is a given; however, we have not performed any detailed hydrologic and hydraulic modeling to determine what impacts, if any, may occur to the residence on the property.

Previous assessment of the dam's discharge capacity indicates that it will be overtopped by the runoff resulting from storms producing less than the 50 year rainfall; and photos from the April 2007 event provide one example of overtopping. In addition, a photo taken after the May 2006 flood shows a short sandbag wall erected near the residence, but it is not known if the sandbags actually were called upon to divert water or were put in place solely as a precaution. As it is the town's intent to explore options related to retaining the dam, and because the design requirements related to discharge capacity are based upon a dam's hazard classification, it is imperative that the impacts associated with dam failure on the residence be more fully explored so that realistic alternatives and related costs for rehabilitation are better defined.

As we spoke about at or August 6th meeting, the town anticipates engaging an engineering consultant familiar with dams to explore the ramifications and costs associated with both the removal and retention of the dam. As part of that work, the selected consultant should perform detailed hydrologic and hydraulic modeling for the following cases and determine the impact of each on the residence:

- Failure of the dam during the flood at which the water level reaches the top of the dam (water level at point of dam overtopping)
- The 50-year flood without dam failure
- The 50-year flood with dam failure
- The 100-year flood without dam failure
- The 100-year flood with dam failure
- The Threshold flood (the flow rate that causes water to be at the elevation of the first floor sill of the house at the right abutment) with dam failure
- The 50-year flood assuming no dam in place
- The 100-year flood assuming no dam in place

NHDES assumes that the bridge opening beneath the NH Route 108 right of way may act as the flow control (which may cause backwater elevations to increase) for most, if not all, of the cases noted. Further, the last two cases may provide important information to assess the peak flood levels to compare with the other Q50 and Q100 scenarios. This modeling should define the expected incremental effects to the house, if any, both with the dam in place or removed. After assessing the extent of damage that could occur under each of these scenarios, NHDES will be able to determine, with you and your consultant, the appropriate design requirements associated with retaining the dam.

We hope this information is helpful in your discussions with prospective engineering consultants, and we encourage you to make us a part of those discussions to provide whatever information and assistance we can.

Sincerely,

Steve N. Doyon, P.E.
Administrator
Dam Safety & Inspection Section

cc: Mr. Todd Selig, Durham Town Administrator
Mr. Michael Lynch, Durham Public Works Director
SND\was\s:\WD-Dam\damfiles\D071003\Letters\20180920 D071003 modeling suggestions.docx

MEMORANDUM

TO: James Weber (NHDES Dam Bureau)

CC: Steve Doyon (NHDES Dam Bureau); April Talon (Durham, Town Engineer); Peter Walker & Dave Cloutier (VHB); Allen Orsi (Pare Corporation)

FROM: Andrew Walker, PH-SW, CFM (Weston & Sampson)

DATE: March 2, 2020

SUBJECT: Mill Pond Dam (D71.03) Hazard Reclassification Analysis

The Town of Durham has contracted a consulting team, led by Vanasse Hangen Brustlin (VHB) and including Weston & Sampson, Pare Corporation, and others, to evaluate the feasibility of several alternatives for reconstructing/rehabilitating/repairing/removing Mill Pond Dam, which is currently in Poor condition[1] and incapable of safely passing its design flood[2] in accordance with NHDES dam safety regulations (Env-Wr 303.11). As part of this current project, the project team has evaluated the previously proposed possibility[3] of reducing the dam's hazard classification and therefore reducing its discharge capacity requirements. This technical memorandum summarizes those analyses.

Mill Pond Dam is currently registered as a Class A or Low Hazard structure with a corresponding requirement that it must pass the 50-year design event while maintaining 1.0 ft. of freeboard below the lowest top of dam elevation (gated outlet / right abutment). On August 6, 2018, the Town and Dam Bureau staff met to discuss the possibility of reducing the dam's hazard classification to Class AA or Non-Menace. The Dam Bureau summarized their response to that meeting in a letter[3] to the Town Engineer on September 20, 2018. Based on that letter and on personnel communication[4] between Weston & Sampson and Steve Doyon and James Weber of the Dam Bureau, we understand that while Mill Pond Dam shall remain a Class A or Low Hazard structure given its structural height and the size of its impoundment, if certain conditions are met, the Town may apply for and receive a waiver such that the dam would be regulated as a non-menace structure. Under this waiver, future dam rehabilitation

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[1] Feb. 2020; Pare Corporation; "Mill Pond Dam Visual Inspection Report"

[2] Mar. 2018; Weston & Sampson; "Mill Pond Study Report"

[3] Sep. 2018; NHDES Dam Bureau (Steve Doyon); "Mill Pond Dam – D071003, Hazard Classification Assessment

[4] Jan. 21-22, 2020; Email correspondence between Andrew Walker (Weston & Sampson), Steve Doyon (Dam Bureau) and James Weber (Dam Bureau)

applications would only require the dam's discharge capacity requirement to meet its current discharge capacity, which is identified below in this memo.

The conditions required to obtain such a waiver are laid out in the Dam Bureau's September 2018 "Hazard Classification Assessment" letter. The Dam Bureau expects that any failure of the dam would likely damage the right abutment as indicated by observations from historical floods such as the May 2006 event, during which the abutment and right training wall were damaged when the dam was overtopped. As a result of that event, damage was also sustained to the side yard of the residence at 20 Newmarket Road, adjacent to the dam's right abutment (looking downstream). The Dam Bureau is concerned that if Mill Pond Dam were to fail, the restriction caused by the Rte. 108 bridge immediately downstream might cause additional backwatering that would cause the 20 Newmarket Road residence to become inundated when it would not otherwise have been or, if it was already inundated, to experience more than 1.0 foot of additional inundation as a direct result of the dam's failure. The Dam Bureau's "Hazard Classification Assessment" letter requires that this concern be assessed through the evaluation of flood levels under four different flow conditions:

1. The 50-year flood;
2. The 100-year flood;
3. (Maximum Pool) The flood which causes the water level in Mill Pond/Oyster River to just reach the top of the dam (right abutment, El. 12.88); and
4. The Threshold Flood, which would cause the water level in Mill Pond/Oyster River to just reach the sill elevation of the walk-out basement of the 20 Newmarket Road residence (El. 14.30).

To assess the potential impacts of a dam failure on the 20 Newmarket Road residence, Weston & Sampson has developed a detailed hydraulic model and conducted steady-state simulations of each of these four flow conditions with the dam in its existing state, with various breach geometries near the right abutment, and with the dam removed. The detailed hydraulic model was developed using the Army Corps' of Engineers HEC-RAS software, v.5.0.3. This model was based on an earlier hydraulic model developed in support of Weston & Sampson's 2018 study of Mill Pond sediment and nutrient management options[2], which the Dam Bureau has previously reviewed and approved. Revisions made to the model in support of this project primarily include:

- Extending the model geometry's downstream limit approximately 1.2 miles downstream, from the wooden footbridge downstream of the Rte. 108 bridge to Johnson's Creek near the Town's Wastewater Treatment Facility;
- Incorporating the wooden footbridge;
- Adding three additional cross-sections between Mill Pond Dam and the wooden footbridge;
- Revising the geometry of Mill Pond Dam and the Rte. 108 bridge based on survey gathered in 2019-2020 in support of the current project;
- Adding additional resolution to the underwater portion of several cross-sections representative of the Mill Pond Dam impoundment based on bathymetric survey data gathered by a VHB-led team in 2009; and
- Adding an additional river reach to represent approximately 1.2 miles of Hamel Brook, which converges with the Oyster River within the Mill Pond Dam impoundment.

The HEC-RAS hydraulic model was also updated to include the four design flow conditions described above. Peak inflow rates to the Mill Pond Dam impoundment during 50- and 100-year design flood were estimated from a series of three hydrologic and hydraulic models described in detail in a February 2020 technical memorandum[5] from the project team to the Dam Bureau. Those models were used to define flow conditions at five locations within the modeled Oyster River-Hamel Brook system:

1. Oyster River at the Oyster Reservoir Dam (071.007);
2. Oyster River at the upstream limit of the Mill Pond Dam impoundment;
3. Hamel Brook headwaters, including overflows from the Lamprey River;
4. Mill Pond Dam impoundment at the confluence of the Oyster River and Hamel Brook; and
5. Mill Pond Dam impoundment at the confluence of the Oyster River and College Brook (represents peak flow at the dam).

The peak inflows to the Mill Pond Dam impoundment (Location 5) during the 50- and 100-year design events are 3,352 and 3,877, respectively. Peak inflows at Mill Pond Dam for the Maximum Pool and Threshold Flow conditions were estimated by iteratively increasing the flow assigned to the Mill Pond impoundment (Location 5) until simulated peak water levels reached El. 12.88 (right abutment) and El. 14.30 (walk-out basement sill elevation), respectively. Maximum Pool and Threshold Flow inflows at Locations 1-4 were estimated based on the relative proportion of flows under the 50-year event conditions. Ultimately, the peak inflows to the Mill Pond impoundment (Location 5) during the Maximum Pool and Threshold Flow conditions were determined to be 1,015 and 2,810 cfs, respectively. The downstream boundary condition, which is important in this case as the dam is a head-of-tide-structure, was assumed to be Mean Higher High Water (MHHW). As no tidal gage data is publicly available for the Oyster River, MHHW was determined from long-term observations at the Fort Point NOAA gage in Portsmouth Harbor (ID 8423898).

Based on these input parameters, river and pond levels for all four flow conditions with the dam in its existing state, with various breach geometries near the right abutment, and with the dam removed. The simulated water levels for all four flow conditions, with the dam in its existing state, are shown in Figure 1 on the following page.

Based on survey data gathered in late 2019/early 2020, the upstream face of the residence is very nearly even with the dam, and it is clear that the residence could be inundated both by flows that overtop the dam and run along native ground in the right floodplain as well as, potentially, backwatering caused by the restriction of the Rte. 108 crossing downstream. To ensure that impacts to the house were adequately modeled, the residence straddles four model cross-sections, one upstream of the dam and three between the dam and Rte. 108. Because water elevations at the upstream face of the dam/residence will always be higher or equal to water levels in the area between the dam and Rte. 108, the water levels and impacts to the 20 Newmarket Road residence, described below, reference model simulation results for the cross-section immediately upstream of the dam/residence.

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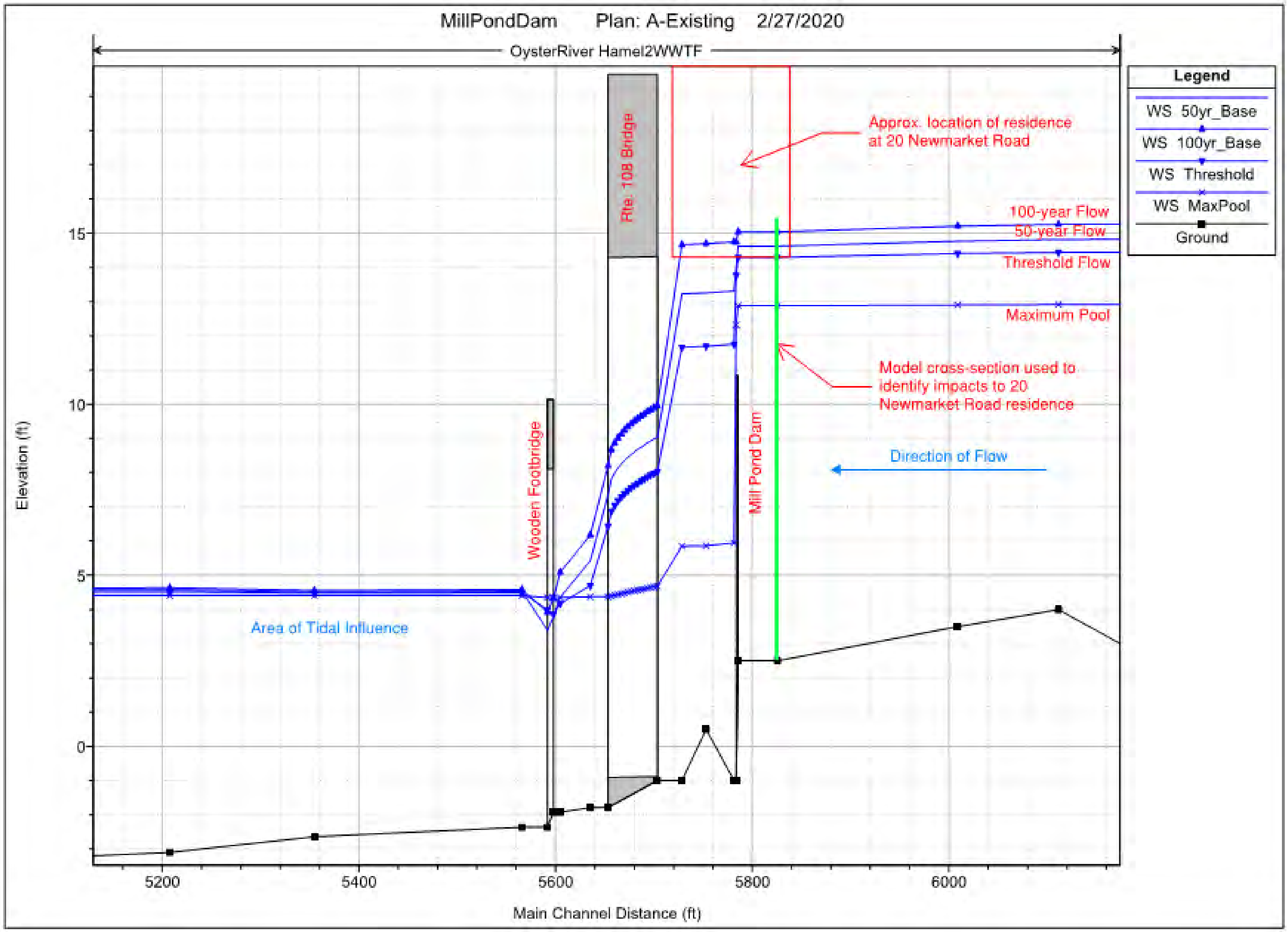
[5] February 20, 2020; Weston & Sampson; “Durham Mill Pond Dam – Design Flow Analysis Methodology”

Figure 1. Simulated Peak Water Levels under Existing Conditions



The most significant takeaway from Figure 1 is that under 50- and 100-year flood conditions, the residence at 20 Newmarket Road is impacted with or without a failure of Mill Pond Dam. In contrast, under the Threshold Flow and Maximum Pool conditions, floodwaters are expected to remain at or below the sill elevation of the residence's walk-out basement (El. 14.3). The key question regarding the hazard classification issue, therefore, is whether a failure of Mill Pond Dam would cause the 20 Newmarket Road residence to become inundated during the Threshold Flow and Maximum Pool conditions or whether a dam failure would worsen the inundation of the residence by 1.0 feet or more under the 50- and 100-year flood conditions.

Weston & Sampson also evaluated predicted peak water levels under several potential breach geometries and a dam removal scenario. Since the dam's right abutment has already been shown to represent a point of weakness, it was assumed to fail under all failure scenarios. The right abutment has a maximum width of 26 feet or approximately 19% of the dam's length. New Hampshire's dam safety regulations regarding dam breach parameters (Env-Wr 502.06) for concrete dams, such as Mill Pond Dam, indicate that typical breach geometries range between the width of one monolith and half the dam's length. The Mill Pond Dam spillway consists of nine cells (defined as the void space between adjacent ribs)[1]. We evaluated the failure of the right abutment as well as three additional scenarios that represent increasingly worse failures, where Cells 1, 1&2, and 1-3 also failed. These four failure scenarios comprise breach geometries of approximately 26, 34, and 42% of the dam's total length, consistent with the State's dam safety regulations. Note that because model simulations were conducting in "steady state," the failure scenario results approximate a post-failure condition where inflows/outflows at the dam are still at peak values. During a dam breach, water levels would begin at the Existing Condition values before dropping to the post-failure values reported in the tables below.

A dam removal scenario was also evaluated for each of the four flow conditions. Dam removal was represented by simply removing the Mill Pond Dam inline structure from the HEC-RAS model. Note that no modifications to the channel or riverbanks were represented as would likely occur as part of an actual removal. Simulated water levels at the Rte. 108 Bridge and 20 Newmarket Road residence are summarized in Tables 1A and 1B and Figures 2A through 2D.

Table 1A: Predicted Peak Water Levels at 20 Newmarket Road Residence

Dam Scenario	Peak Water Level (ft. NAVD88) by Flow Condition*			
	50-year Flood	100-year Flood	Threshold Flow	Maximum Pool
Existing	14.62	15.04	14.30	12.88
Dam Failure** Right Abutment	14.29	14.90	13.96	12.52
Dam Failure** Right Abutment and 1 Cell	13.86	14.81	13.44	11.72
Dam Failure** Right Abutment and 2 Cells	13.51	14.76	12.66	9.86
Dam Failure** Right Abutment and 3 Cells	13.35	14.73	12.05	8.14
Dam Removed	13.24	14.69	11.67	5.55

*Peak water levels are reported for the cross-section immediately upstream of the dam/residence.

**Dam failure values approximate post-failure conditions. Peak water levels during dam failure would begin equal to Existing Conditions before dropping to the post-failure values presented in the table.

Table 1B: Predicted Impacts to 20 Newmarket Road Residence

Dam Scenario	Freeboard*				Change from Existing**			
	50-yr	100-yr	Threshold	Max Pool	50-yr	100-yr	Threshold	Max Pool
Existing	-0.32	-0.74	0.00	1.42	---	---	---	---
Dam Failure Right Abutment	0.01	-0.60	0.34	1.78	0.33	0.14	0.34	0.36
Dam Failure Right Abutment and 1 Cell	0.44	-0.51	0.86	2.58	0.76	0.23	0.86	1.16
Dam Failure Right Abutment and 2 Cells	0.79	-0.46	1.64	4.44	1.11	0.28	1.64	3.02
Dam Failure Right Abutment and 3 Cells	0.95	-0.43	2.25	6.16	1.27	0.31	2.25	4.74
Dam Removed	1.06	-0.39	2.63	8.75	1.38	0.35	2.63	7.33

*Freeboard is measured down from the sill of the residence's walk-out basement (El. 14.30). Positive values indicate no inundation occurs.

** Positive values indicate reduced flooding.

The results summarized in Tables 1A and 1B are consistent: regardless of flow condition or dam breach geometry, a failure of Mill Pond Dam is not expected to increase flooding impacts at the location of the 20 Newmarket Road residence. Under no breach scenario or design flood event is the walk-out basement expected to flood when it would not have or experience an additional 1.0 feet or more of flooding due to a failure of the dam. Removal of the dam is expected to reduce flooding impacts at 20 Newmarket Road. Based on the Dam Bureau's "Hazard Classification Assessment" letter of September 2018, the results presented above are consistent with the criteria necessary for the discharge capacity requirement of Mill Pond Dam to be lowered from the 50-year design flow, 3,352 cfs, to its existing discharge capacity. At maximum pool, the dam's spillway currently discharges 1,015 cfs. However, based on the State's dam safety regulations, the dam can safely pass 352 cfs while maintaining 1.0 feet of freeboard.

Figure 2A. Simulated Peak Water Levels During the 50-year Design Flood

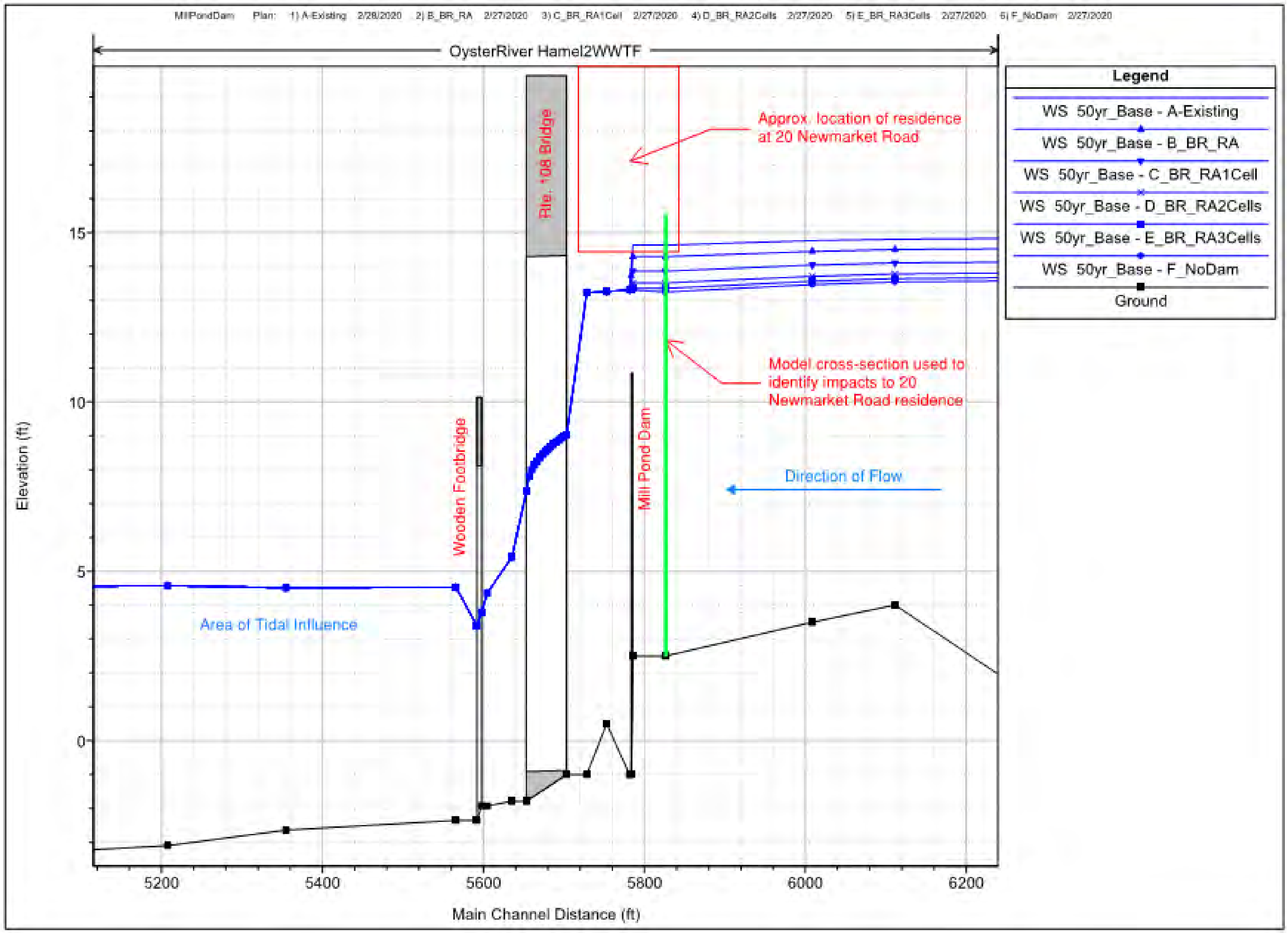


Figure 2B. Simulated Peak Water Levels During the 100-year Design Flood

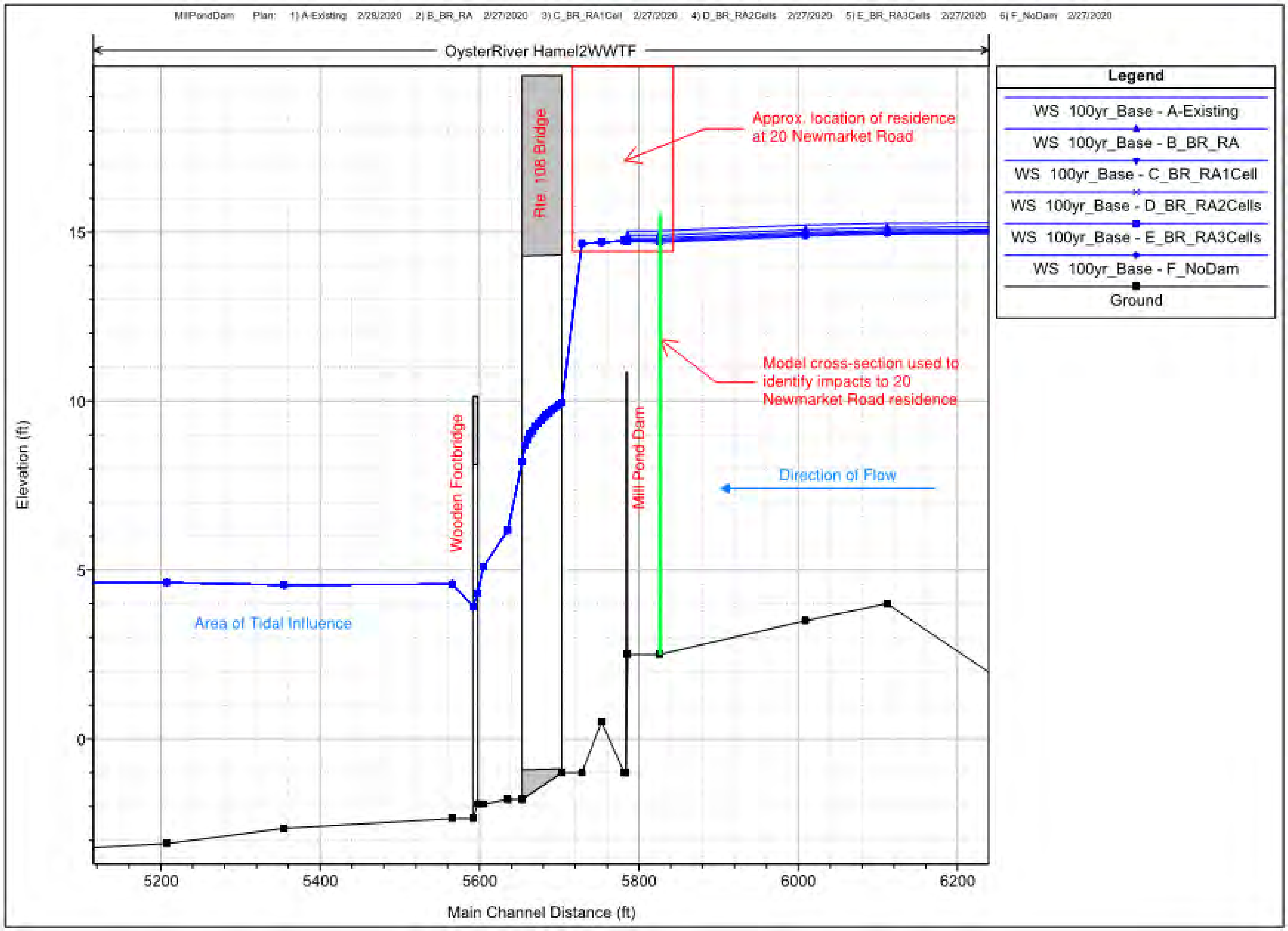


Figure 2C. Simulated Peak Water Levels Under the Threshold Flow Condition

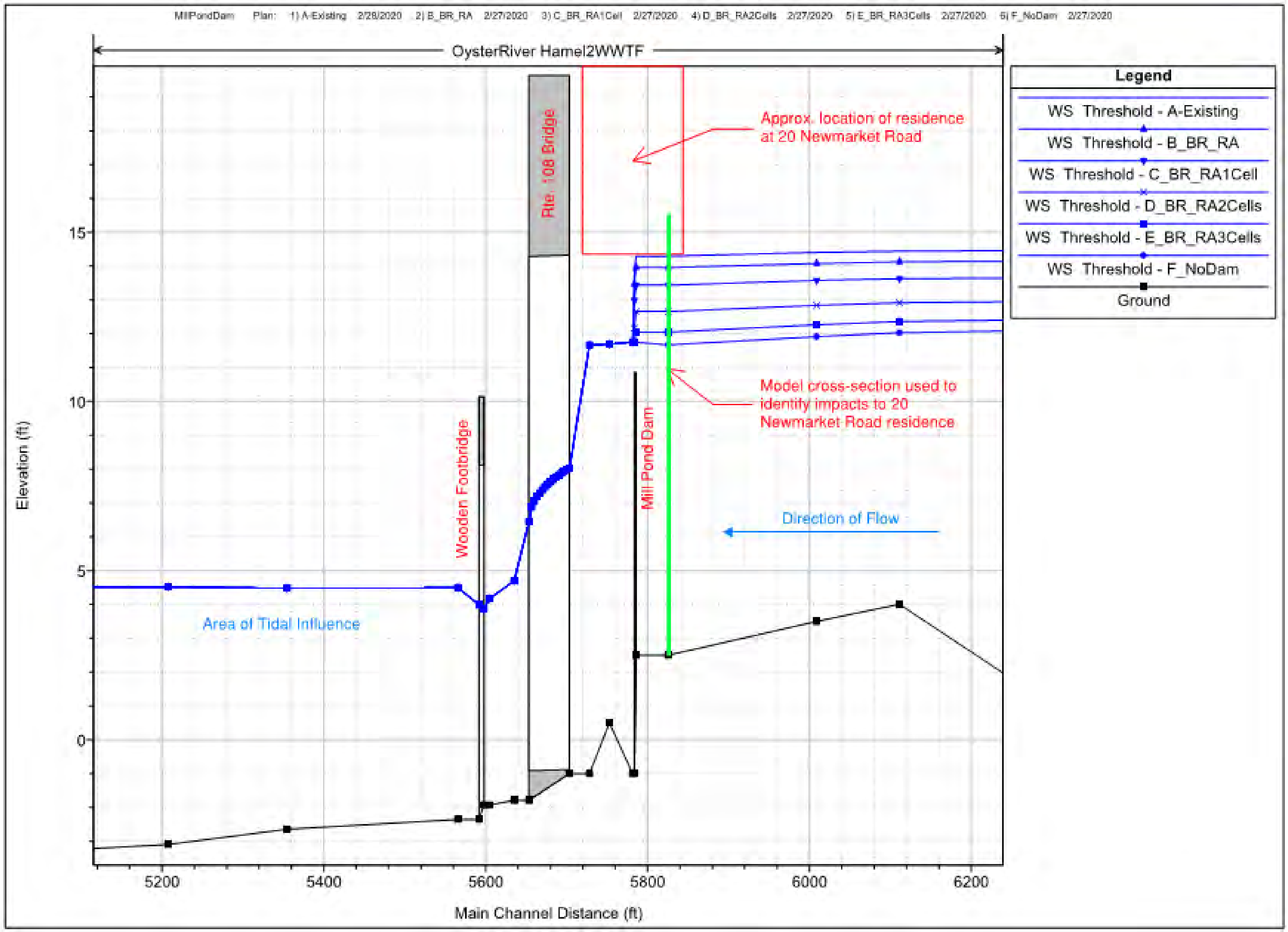
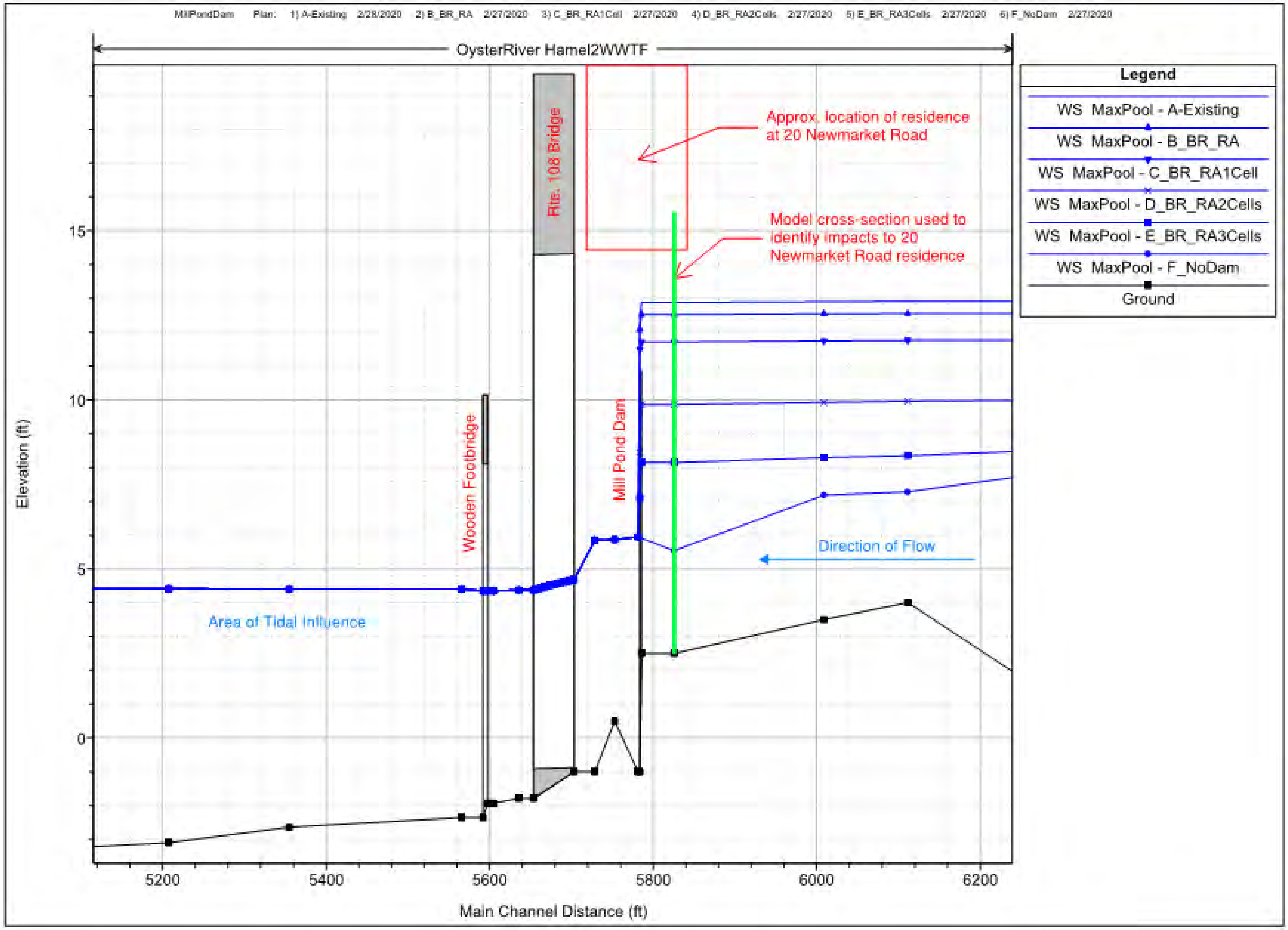


Figure 2D. Simulated Peak Water Levels Under the Maximum Pool Condition



NHDES

The State of New Hampshire

Department of Environmental Services

Robert R. Scott, Commissioner

Ms. April Talon, Town Engineer
Department of Public Works
Town of Durham
100 Stone Quarry Drive
Durham, NH 03824

April 17, 2020

RE: Mill Pond Dam – D071003

Dear Ms. Talon;

The intent of this letter is to provide information and determinations on issues associated with the above-referenced dam. Such issues include the dam's current hazard classification and how the New Hampshire Department of Environmental Services, Dam Bureau (NHDES) may regulate the dam moving forward. This latter issue includes both dam reconstruction permitting and ongoing dam safety regulation.

As noted in its September 20, 2018 letter NHDES, based upon information that was available at the time, considered the dam to be classified (at a minimum) as a Low hazard structure for two reasons. The first relates to anticipated dam failure impacts to property at the dam's right abutment (20 Newmarket Road). Specifically, a failure of the dam in this area would likely cause significant erosion damage to property other than the dam owner's and, in NHDES's opinion, result in "low economic loss" in accordance with Env-Wr 101.24. Specifically, meaning "reversible environmental loss to undeveloped land or minor damage to uninhabited structures, such as storage sheds, or to sites listed or tracked by the natural heritage inventory, as maintained by the department of resources and economic development". Second, in accordance with Env-Wr 101.28(a), since the dam has a height of greater than 6 feet and a storage capacity of greater than 50 acre-feet it cannot be considered a Non-Menace structure. Such dams are informally known as 6/50 dams.

Further, as suggested by the September 18th letter, a more detailed assessment of the potential impacts associated with dam failure was performed by Weston & Sampson. Both a summary memorandum (dated March 2nd) and associated electronic HEC-RAS files were provided to NHDES for review on March 4th of this year. NHDES concurs with the methods used to model the impacts of failure as well as the conclusion made. Findings indicate that, even though the adjacent residence receives flooding during the 50 and 100-year events by 3 and 9 inches, respectively, failure of the dam under those conditions does not result in any increase in flooding. Further, failure under the threshold (water about to enter the residence) and the full pool conditions actually causes a slight drop in water levels. Based on these results, the dam will remain classified as a Low hazard structure.

As you are aware, in accordance with current dam safety regulations, Low hazard dams must normally be equipped to pass the runoff resulting from the depth of rainfall associated with the 50-year/24-hour storm event. As the property at 20 Newmarket Road has been identified as the sole development to be impacted, NHDES has agreed that it would consider waiving the design requirements associated with Low hazard dams in lieu of those pertaining to Non-Menace dams if certain conditions could be met. These are a) the need to enter into a formal agreement with the owner of the 20 Newmarket Road property and b) the requirement that any reconstruction alternatives chosen be such that the current dam's unoperated discharge capacity is not reduced. For the former condition, the agreement, easement or right should reflect the town's (dam owner) responsibility for any maintenance, operation or reconstruction activities and access to accomplish such, along with assurances that any damages that might be incurred to the property on account of the dam will be the responsibility of the town to address. Ideally, any instrument crafted between parties should be tied to the property itself and be filed at the Strafford County Registry of Deeds.

Besides the potential to be regulated as a Non-Menace dam for the purposes of reconstruction, NHDES will also change its practices associated with routine dam safety inspections. As a Low hazard dam, inspections will continue to occur on a 6-year schedule and the annual dam registration fee (currently $400/yr.) will continue to be assessed; however, the results of the inspections will be communicated via Notices of Inspection rather than Letters of Deficiency. This is a current practice applicable to dams whose hazard classifications are based solely on their height and storage characteristics – or 6/50 dams. The benefit here is that our findings will be presented as recommendations for your consideration rather than requirements.

Finally, NHDES has reviewed the findings resulting from the detailed inspection that Pare Corporation performed in December of 2019. We agree with its assessment that the dam is in poor condition, and note that the conditions observed within the spillway cells (spillway piers and slab sections within the individual Ambursen sections) have, in several cases, worsened since NHDES's last observation of these areas in December 2017. The report summarizes the results of stability analyses completed by Stephens Associates in 2009. Certainly, should reconstruction be the selected alternative, the findings of the 2019 inspection should be used to update the assessment of the dam's stability and its related needs.

If you have additional questions as you move forward with plans to either reconstruct or remove the dam, please contact me.

Sincerely,

Steve N. Doyon, P.E.
Administrator
Dam Safety & Inspection Section

ec: Mr. Todd Selig, Durham Town Administrator
Mr. Michael Lynch, Durham Public Works Director
Mr. Peter Walker, P.E., VHB
Ms. April Talon, Town Engineer, DPW, Town of Durham
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Appendix B:
Dam Inspection Report

PREPARED FOR: TOWN OF DURHAM, NH

MILL POND DAM
VISUAL INSPECTION REPORT
DURHAM, NEW HAMPSHIRE

DAM #071.03

PREPARED BY:

PARE CORPORATION
10 LINCOLN ROAD SUITE 210
FOXBORO, MASSACHUSETTS 02035

PARE PROJECT NO. 19169.00

MARCH 2020

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Figure 1: Locus Plan
Figure 2: Aerial Plan
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Appendix B: Photographs
Appendix C: Common Dam Safety Definitions
Appendix D: References and Resources
Appendix E: Visual Dam Inspection Limitations

1.0 DESCRIPTION OF PROJECT

1.1 General

1.1.1 Authority

The Town of Durham has retained Pare Corporation of Foxboro, Massachusetts, working under subcontract to VHB, Inc., to perform a visual inspection and develop a report of conditions for the dam at Mill Pond along the Oyster River in Durham, New Hampshire. This inspection and report were performed in general accordance with the New Hampshire Department of Environmental Services Env-Wr 100-700 Dam Rules.

1.1.2 Purpose of Work

The purpose of this investigation was to inspect and document the present condition of the dam and appurtenant structures in accordance with current dam safety regulations to provide information that will assist in both prioritizing dam repair needs and planning/conducting maintenance and operation. The scope of the inspection and report development is also intended to provide a baseline inspection of the entire structure as required per Condition #1 of the February 12, 2018 Letter of Deficiency issued by the New Hampshire Department of Environmental Services.

The investigation was divided into three parts: 1) obtain and review available files including reports, investigations, and data pertaining to the dam and appurtenant structures; 2) perform a visual inspection of the site; and; 3) prepare and submit a final report presenting the evaluation of the structure.

1.1.3 Common Dam Safety Definitions

To provide the reader with a better understanding of the report, definitions of commonly used terms associated with dams are provided in Appendix C. Many of these terms may be included in this report. The terms are presented under common categories associated with dams which include: 1) orientation; 2) dam components; 3) hazard classification; 4) general; and 5) condition rating.

1.2 Description of Project

1.2.1 Location

The Mill Pond Dam is located in the Town of Durham, approximately 600 feet southeast of the Durham Town Hall. The dam impounds water along the Oyster River to form Mill Pond. The dam is located at the eastern side of the impoundment near coordinates 43.1305°N/70.9194°W as shown on Figure 1: Locus Plan and Figure 2: Aerial Plan.

The dam is accessible from a vegetated area at the left abutment. There is no parking area at the dam. To reach from dam from I-95N, take exit 6N towards Dover and keep left at the fork to continue toward US-4 W. Follow US-4 W for 4.8 miles and turn left onto US-4W (Boston Harbor Road). Continue straight on US-4 W for 0.2 miles. At the traffic circle take the second exit to continue onto US-4W. Follow US-4 W for 3.4 miles. Take the exit for NH-108 towards Durham/Newmarket and turn left onto NH-108 S/Dover Road. Follow Dover Road for 0.7 miles and turn left onto Newmarket Road. After 0.2 miles, the dam will be on the right.

1.2.2 Owner/Caretaker

The dam is currently owned and operated by the Town of Durham. Maintenance for the structure is primarily completed by the Town's Department of Public Works.

1.2.3 Purpose of the Dam

The dam currently impounds water for recreational purposes. The dam was originally constructed in 1913 to provide hydropower to the Jenkins Mill that previously existed at the right abutment.

1.2.4 Description of the Dam and Appurtenances

The Mill Pond Dam is an approximately 140-foot long concrete dam. The Mill Pond Dam has a maximum structural height of approximately 13 feet. The dam consists of three components: 1) Primary Spillway; 2) Gated Outlets; and 3) Fish Ladder.

The spillway structure for the dam is an approximately 100-foot wide reinforced concrete modified Ambursen type buttress dam. The spillway consists of a reinforced concrete shell supported by reinforced concrete ribs spaced approximately 12 feet on center beneath the crest. Flow over the spillway discharges into a bedrock plunge pool before discharging beneath the bridge carrying Newmarket Road/NH-108.

The gated outlets are located at the right end of the dam and consists of two 4-foot wide timber gate controlled bays. The gate operators consist of rack and pinion type operators with timber gate stems. The right-most gate structure was previously used to supply the mill downstream with hydropower and is currently not utilized; the left gate structure is presently used as the low level outlet. Flows from the low-level outlet enter the gate structure and outlet to the downstream channel where the masonry structure for the previous mill foundations are located.

A Denil (baffle) fishway is located at the left end of the dam.

1.2.5 Operations and Maintenance

The Town of Durham is responsible for operations and maintenance at the dam. Operations at the dam include the operation/exercising of the gate. Maintenance activities at the dam include cutting of vegetation along at the abutments.

1.2.6 Hazard Potential Classification

In accordance with current classification procedures under State of New Hampshire Dam Rules, Mill Pond Dam is currently classified as a **Low** hazard potential dam.

1.3 Engineering Data

1.3.1 Discharges at the Dam Site

No records of discharges at the dam site were made available during the preparation of this report.

1.3.2 General Elevations (feet)

Elevations are based upon a survey completed by VHB in December 2019 and January 2020. Elevations reference the NAVD88 vertical datum.

A. Top of Dam	
i. Left abutment:	15.5 ft ±
ii. Right Abutment:	12.9 ft ±
B. Normal Pool (Spillway Crest)	10.85 ft ±
C. Maximum Pool	12.89 ft ±

1.3.3 Primary Spillway

A. Type	Broad Crested Weir (Ambursen type dam)
B. Width	100 ft ±
C. Spillway Crest Elevation	10.85 ft ±

1.3.4 Low-Level Outlet

A. Type	Gate Controlled Structure
B. Conduit	
i. Right	18-inch Steel Pipe (corroded)
ii. Left	48-inch Wide Concrete Opening
C. Right Gate Invert	
i. In	Unknown
ii. Out	0.8 ft ±
iii. Outlet Diameter	18 inches ±
D. Left Gate Invert	
i. In	Unknown
ii. Out	1.7 ft ±
iii. Outlet Size	4 ft by 6 ft ±
E. Outlet Control	Two Gates of unknown size

1.3.5 Fish Ladder

A. Type	Denil (Baffle)
B. Width	4 feet
C. Invert	
i. In	12.2 ft ±
ii. Out	0.1 ft ±

1.3.6 Construction Records

The Mill Pond Dam was constructed in 1913 to replace the last of a series of timber dams that provided hydropower. The Mill Pond Dam provided hydropower to the Jenkins Mill when it was first built. No construction documents were available for review.

The Mill Pond Dam was repaired in 1974. No construction documents were available for review. Repairs to the dam in 1974 consisted of:

- Repairs to the concrete within the cells of the spillway.
- Construction of the fish ladder at the left abutment.
- Reconstruction of the downstream edge of the spillway crest

1.3.7 Operations Records

No operations records are available or known to exist for this structure.

2.0 INSPECTION

2.1 Visual Inspection

Mill Pond Dam was inspected on December 18, 2019. At the time of the inspection, temperatures were near 36°F with partly cloudy skies. Photographs to document the current condition of the dam were taken during the inspection and are attached at the end of this report.

To facilitate inspection of the spillway, the Durham DPW implemented a shallow drawdown of the impoundment through opening of the left gated outlet. The drawdown lowered the level of the impoundment approximately 4 to 5 inches with the pool level slowly rising as the inspection was completed.

Underwater areas were not inspected as part of the field activity.

2.1.1 General Findings

In general, the overall condition of the Mill Pond Dam was found to be **Poor** condition**.** The specific observations are identified in more detail in the sections below. Please note that snow cover throughout the right and left abutments limited inspection of these areas.

2.1.2 Primary Spillway

For the purposes of the report, inspection of the spillway was segmented between three distinct components of the spillway including the spillway slab, training walls, and spillway cells (defined as the void space between adjacent ribs).

Spillway Slab

- While observing the impoundment filling, flow over the spillway started within the left third section of the spillway, indicating the right portion of the spillway is slightly higher than that of the left portion of the spillway. It was not apparent if this was the result of differential settlement, uneven crest scour, or an as-built condition.
- Two construction joints were noted on the spillway approximately 30-feet apart. The condition of the construction joints could not be observed due to snow coverage during the drawdown.
- A full inspection of the spillway crest could not be completed due to snow coverage during the drawdown and water flow over the spillway when the pond refilled. Previous reports noted transverse cracks along the crest of the spillway.
- Scour was present along the spillway crest.

Training Walls

- Scour was present at the joint between the right training wall and spillway, measuring 9-inches deep, 12-inches tall, and 5-feet long.
- Minor scour (less than 1 inch deep) was noted along the water level at the left training near the spillway.

- A spall (approximately 3 feet long) is located at the bottom right side of the right training wall with debonded rebar at the downstream face of the right training wall at the water line.
- Two diagonal cracks are located along the right training wall with efflorescence along the crack. The lower diagonal crack is more significant with delamination within two feet of the crack.

Spillway Cells

For the purposes of inspection, individual cells were number consecutively from Cell No. 1 at the right end of the spillway to Cell No. 9 at the left end of the spillway adjacent to the fish ladder. The following conventions were applied:

- The right and left sides of the cells are defined by the face of the rib adjacent to each cell facing into the cell (i.e., the left wall of Cell No. 1 refers to the right side of the rib between Cell No. 1 and Cell No. 2).
- The underside of the spillway slab was subdivided into 5 sections from downstream to upstream with:
  - Section 1 being the bottom of the downstream lip of the slab,
  - Section 2 being the upstream face of the downstream lip of the slab
  - Section 3 being the underside of the downstream slope of the spillway slab crest.
  - Section 4 being the underside of the spillway slab crest
  - Section 5 being the underside of the upstream slope of the spillway slab.

The following deficiencies were noted within the cells of the spillway following the preceding naming convention. Major deficiencies are listed in the table below. Please reference the Spillway Cell Inspection Figures for minor deficiencies and more specific detail about the dimensions and locations of the deficiencies listed below. The Spillway Cell Inspection Figure are included in Appendix A.

- In general, the concrete within the cells had scour along the apparent normal tailwater waterline.
- Map cracking was noted throughout the cell walls.
- Efflorescent staining was typical within all of the cells and typically indicated more severe deterioration.
- The spillway and ribs appeared to be constructed of concrete with aggregate up to 4 inches in diameter.
- The following was noted within the individual spillway cells:

Cell No	Section	Observations
1	Right Wall	• The joint at Face No. 3 appeared to be leaking as indicated by ice buildup on the wall. The joint was open approximately 0.5 inches. • Spalling was present along the wall up to 1.5-inches deep on the upstream half of the wall and on the bottom downstream half of the wall.

	Left Wall	▪ A 10-inch tall by 6-inch wide area of section loss was present through the wall between cell 1 and cell 2. Spalling was present within this area. Exposed aggregate around the hole was loose in areas and could be easily broken away with limited effort.
	1	No major deficiencies noted. See Appendix A for more detail.
	2	No major deficiencies noted. See Appendix A for more detail.
	3	▪ The downstream half of this face was repaired, with an 18-inch spall and delamination up to 1.5 inches deep present at the joint between the repair and original concrete. ▪ An open joint with efflorescent staining was present at the joint between the left wall.
	4	No major deficiencies noted. See Appendix A for more detail.
	5	▪ A spall approximately 4-feet long with exposed rebar was present at the left joint. ▪ A repair was present along the right side, that was up to 0.25-inches thick. An approximate 0.5-inch separation was present between the existing and repaired concrete. ▪ Orange staining was noted at the upstream most right corner. ▪ Delamination with slight bulging was present along the center of the face.
	Misc	None
2	Right Wall	▪ A spall approximately 3-inches wide, 0.5-inches deep with iron oxide staining was present along the full length of the upstream side of the wall. ▪ A large spall with a 10-inch by 6-inch section of 100 percent section loss was present along the downstream end. The spall measures approximately 44-inches by 24-inches.
	Left Wall	▪ A spall with a crack in the center was present along the downstream side of the wall and measured approximately 30-inches from the top to the bottom of the spall, 12-inches wide, and 5-inches deep.
	1	▪ A spall was present at the downstream left end measuring 12-inches long, 4-inches wide, and up to 4-inches deep.
	2	No major deficiencies noted. See Appendix A for more detail.
	3	No major deficiencies noted. See Appendix A for more detail.
	4	No major deficiencies noted. See Appendix A for more detail.
	5	▪ Delamination was present along the right side of the wall face. The repaired area appeared to be delaminating from the original concrete. Minor bulging within this area was also noted. The dimensions of the area of delamination vary and can be seen in more detail in Appendix A. ▪ Iron oxide staining was noted at the right upstream most corner.
	Misc	• Ceiling face numbers 1, 2, and 3 were repaired or partially repaired. The repair on Ceiling face No. 3 typically measured 2 feet from the downstream joint with Ceiling Face No. 2. The repair was approximately 0.5-inches thick.
3	Right Wall	• A spall was present at the downstream end measuring 25-inches long, 18-inches wide, and up to 2-inches deep.
	Left	• A spall with debonded rebar was present at the downstream end measuring

	Wall	25-inches long and 8-inches wide. A hand could be wrapped around the piece of rebar. • An open crack/spall with delamination was present, approximately 3 to 4-inches wide. The crack within the spalled area is tight (near 1/8-inch wide).
	1	• Areas of a past repair are apparent; the repair appears intact
	2	• Areas of a past repair are apparent; the repair appears intact
	3	• A partial repair was present along this face. The dimensions of the repair can be seen in more detail in Appendix A. • At the joint between the repair and the original concrete was a spall that measures up to 9-inches wide, 68-inches long, and up to 3.5-inches deep.
	4	No major deficiencies noted. See Appendix A for more detail.
	5	No major deficiencies noted. See Appendix A for more detail.
	Misc	None
4	Right Wall	• A spall with a 4-inch long, 0.040-inch wide crack was present at the downstream end. The spall measured 30-inches tall, 22-inches wide and up to 4-inches deep. A 5-inch deep cored hole was present within the approximate center of the spall. • A crack with iron oxide staining was present along the upstream edge. The crack was up to 6-inches wide and 2-inches deep. Seepage appeared to be evident based upon ice along the wall below the crack.
	Left Wall	• A spall with debonded rebar was present along the downstream end measuring 18-inches long, 18-inches wide, and up to 4-inches deep.
	1	• Debonded rebar and spalling was present on the right end, measured to be approximately 6-inches wide by 16-inches long.
	2	• Areas of past repairs are apparent; the repairs appear to be intact.
	3	• Areas of past repairs are apparent; the repairs appear to be intact.
	4	No specific observations
	5	• Three spalls were present along the upstream toe of this wall. Iron oxide staining was present on either side of this wall within the spalls. An section of debonded rebar was also present.
	Misc	None
5	Right Wall	• A spall with debonded rebar was present at the downstream end measuring 3-feet long, 1-foot wide and approximately 3.5-inches deep.
	Left Wall	• No significant areas of deterioration were noted.
	1	• Areas of past repairs are apparent; the repairs appear to be intact.
	2	• Areas of past repairs are apparent; the repairs appear to be intact.
	3	No major deficiencies noted. See Appendix A for more detail.
	4	No major deficiencies noted. See Appendix A for more detail.
	5	No major deficiencies noted. See Appendix A for more detail.
	Misc	None
6	Right Wall	• No significant areas of deterioration were noted.
	Left	• A spall with delamination and efflorescent staining was present on the

	Wall	upstream side measuring 18 inches long by 6 inches wide.
	1	- Spall with debonded rebar was present on the left portion of the ceiling face and measured 14-inches long and up to 2-inches deep.
	2	- A 2 to 6-inch wide repair was present along the downstream edge of the face.
	3	- An 8-inch diameter previously repaired spalled area was present on the right side of the ceiling face.
	4	No specific observations
	5	- Three spalls with delamination were present along the left edge of the wall.
	Misc	None
7	Right Wall	- A spall with exposed aggregate was present on the downstream end measuring 14-inches wide and up to 3-inches deep. - An open crack with exposed aggregate was present along the upstream perimeter of the wall approximately 1 to 6-inches from the ceiling. The spalling around the crack was approximately 6-inches wide and up to 2.5-inches deep. Seepage appeared to be evident based on ice on the wall below the crack. - The concrete above the crack was sounded for deterioration and appeared to be delaminated.
	Left Wall	- A spall up to 1.5-inches deep was present on the downstream end of the wall.
	1	- Areas of past repairs are apparent; the repairs appear to be intact.
	2	- Areas of past repairs are apparent; the repairs appear to be intact.
	3	- The face was sounded and appeared to be significantly delaminated. Significant efflorescent staining buildup was present.
	4	No major deficiencies noted. See Appendix A for more detail.
	5	No major deficiencies noted. See Appendix A for more detail.
	Misc	None
8	Right Wall	- A total of eight repairs appeared to be present on the wall; five of the apparent repairs were not visible due to timber falsework over the repairs.
	Left Wall	- Five apparent repairs were present on the wall, the repairs were not visible due to timber falsework over the repairs.
	1	- Areas of past repairs are apparent; the repairs appear to be intact.
	2	- Areas of past repairs are apparent; the repairs appear to be intact.
	3	- A 3-inch diameter, 0.5-inch deep spall with exposed rebar was present on the upstream edge of the ceiling face.
	4	No specific observations
	5	- A spall with exposed rebar was present on the downstream end of the face that measured 4-feet long and up to 8-inches wide.
	Misc	None
9	Right Wall	No major deficiencies noted. See Appendix A for more detail.
	Left Wall	No major deficiencies noted. See Appendix A for more detail.
	1	No major deficiencies noted. See Appendix A for more detail.

	2	No major deficiencies noted. See Appendix A for more detail.
	3	No major deficiencies noted. See Appendix A for more detail.
	4	No major deficiencies noted. See Appendix A for more detail.
	5	No major deficiencies noted. See Appendix A for more detail.
	Misc	No major deficiencies or specific observations were noted in Cell No. 9.

- The following was noted on the downstream side of the ribs:
  - In general, spalling was present along either side of each rib.
  - The rib between Cell Nos. 3 and 4 was spalled with debonded rebar. A hand could be wrapped around the debonded rebar.
  - The rib between cells 4 and 5 had a 3-foot tall spall with debonded rebar.

2.1.3 Gated Outlet Structure

The following was noted at the outlet structure:

Upstream Face

- A spalled section, approximately 6 to 8-inches wide, was present on the right side of left gate invert at the waterline.
- The right gate invert was submerged at the time of the inspection.
- Moss/ice/snow cover was present on the upstream face of the concrete at the low level outlet structure, limiting inspection.

Crest

- Moss/ice/snow cover was present on the crest of the concrete at the low level outlet structure, limiting inspection.

Downstream Face

- Map cracking was present throughout the gate structure headwall.
- Concrete spalling with exposed rebar was present to the left of the left gate outlet. The spall measured approximately 2-feet wide by 2-feet tall and up to 3.5-inches deep.
- The concrete along the bottom portion of the wall (approximately 5 feet from mudline at the wall) was significantly deteriorated with efflorescence/iron oxide staining.
  - Significant delamination with exposed rebar was present on either side of the old pipe from the mill structure. The scour and spall were up to 4-inches deep.
- Seepage, approximately 0.5 gpm, was present through the downstream face of the gate structure at the concrete to the left of the right outlet.
- Seepage, approximately 1 to 2 gpm, was present through the downstream face of the gate structure between the two outlets approximately 2 feet above the top of the left gate opening.
- Signs of potential seepage appeared to be present due to the presence of ice along the downstream face of the concrete at the gate headwall.

- The right gate outlet pipe was fully corroded.
- Section loss and scour was present at the right end of the concrete cap surrounding the outlet pipe.
- The downstream masonry wall immediately right of the right outlet appears to bulge in the downstream direction approximately 6-inches between the gate section and the old mill foundation. Seepage was present at the base of this section of wall, flowing at approximately ten gallons per minute.
- No chinking stones or mortar were present within the downstream wall or the walls at the abutment.
- A crack/spall was present on the to the left of the left gate outlet extending from the right side of the right training wall to the gate outlet. The crack was approximately 3-inches wide and up to 2-inches deep

Gates/Conduits

- The left gate was operable, but the gate was reportedly limited to an opening of 8-inches.
- Leakage through the left gate is approximately 1 to 3 cfs.
- The left gate was operated during the inspection to lower the levels within the impoundment.
- The right gate was reportedly inoperable. The gate was historically used for the mill that was once downstream of this gate.

2.1.4 Fish Ladder

The following was noted at the fish ladder:

- The fish ladder structure consisted of timber baffles.
- The stop logs at the upstream side of the fish ladder exit pool were leaking approximately 5 gpm.
- Scour was present along the water line of the fish ladder pool structure.
- The grating over the fish ladder structure appeared to be in good condition.
- The footing for the training wall between the fish ladder and Cell No. 9 was undermined at the base of the wall. The void was probed up to 3 feet under the training wall. The undermined area was approximately 2-feet long and 1-foot in height.
- An open construction joint was present at the 180-degree turn in the fish ladder and was approximately 1-inch wide.
- A repair was present along the right side of the downstream training wall. The repair area showed indications of delamination.
- An open joint with vegetation growing was present at the concrete between the primary spillway and fish ladder structure. This area was previously reported to be leaking, but flow over the spillway limited the view of any leakage.

2.1.5 Downstream Area

The water immediately downstream of the Mill Pond Dam is tidal and is considered brackish. Immediately downstream of the spillway is a 10 to 15-foot wide plunge pool lined with boulders and bedrock. Water flows from the plunge pool and passes under Newmarket Road in a bedrock and boulder lined channel, approximately 100 feet downstream of the spillway. The bridge at Newmarket Road appeared to be founded on bedrock and in good condition with no signs of scour. Flows through the Newmarket Road Bridge then pass under a pedestrian bridge approximately 200 feet downstream before entering Little Bay and eventually the Piscataqua River.

2.1.6 Reservoir Area

The dam is located at the eastern end of the impoundment. Mill Pond extends approximately 1,000 feet upstream of the dam; however, the dam also impounds water upstream along the Oyster River and Hamel Brook with backwater influences from the dam extending 2,800 feet upstream of the pond along the Oyster River and approximately 1,900 feet upstream of the Oyster River along the Hamel Brook.

The perimeter of the impoundment is generally un-developed along the immediate shoreline with few residential properties around the impoundment. Mill Pond Road borders the impoundment to the north. Slopes are generally flat surrounding the impoundment area.

2.2 Caretaker Interview

Ms. April Talon was present during the inspection. Information provided by Ms. Talon has been incorporated into this report.

2.3 Operation and Maintenance Procedures

There was no formal operations and maintenance manual for the dam available at the time of the inspection.

2.3.1 Operational Procedures

Operable components include the two gates at the low-level outlet. The right most-gate is inoperable and was previously used as hydropower when the mill was operational. The left-most gate is operable though the range of operability is limited to approximately 8 inches. The fish ladder structure does not appear to have significant capacity to be considered as an operational outlet to the dam; stoplogs may be adjusted as necessary to support fish migration.

2.3.2 Maintenance of Dam and Operating Facilities

Maintenance activities at the dam include cutting of vegetation along the left abutment and clearing the spillway and discharge area of debris. The caretaker also routinely completes informal inspections and responses to public comments to check the condition of the dam. In general, the caretaker was knowledgeable of current conditions at the dam.

3.0 ASSESSMENTS

3.1 Assessments

In general, the overall condition of the Mill Pond Dam is **Poor** with the following deficiencies identified:

TABLE 3.1: Deficiency Summary

Deficiency Number	*Description*
1	Concrete deterioration of the spillway cells and ribs including: • Cracks and spalls with evidence of seepage; • Section loss of the rib between Cell Nos. 1 and 2; • Delamination of the repaired concrete from the original concrete; • Debonded rebar within multiple cells;
2	Seepage at the downstream corner of the right stone masonry abutment wall;
3	Seepage through the downstream face of the gate structure;
4	Inoperable right gate outlet;
5	Concrete deterioration at the gate outlet structure including delamination, cracking, and spalling;
6	Insufficient capacity to pass the SDF;

In general, the conditions observed during this inspection have continued to deteriorate since the previous inspections.

The following table provides a summary of previous recommendations and their status at the time of the inspection:

Previously Identified Deficiency	***Resolution or Current Condition***
Concrete deterioration and spalling on the downstream face of the outlet works, ribs, interior of the spillway cells	*Deterioration has continued to progress. The area of section loss between Cell Nos. 1 and 2 has increased in size since the 2018 inspection by NHDES. Seepage through the outlet structure was not previously observed.*
Minor seepage at the downstream corner of the right masonry abutment wall	*Seepage continues*
Insufficient ability to pass the design storm with one foot of freeboard at the dam	*Same deficiency*
Deterioration of the mid-1970's concrete repair work	*Deterioration has continued to progress*
EAP needs updating and testing	*No apparent change*
Update O&M manual	*No apparent change*
Area of section loss between cells 1 and 2	*Section loss had continued*

3.2 Current Hazard Potential Classification

The Mill Pond Dam is currently classified as a **Low** hazard potential dam due to the impacts dam failure may have on the adjacent and downstream properties and because the height exceeds 6 feet and the storage capacity exceeds 50 acre-feet.

According to an NHDES letter dated September 2018, Mill Pond Dam is classified as low not only because of the "6/50" case, but also the potential for damage to be done to the property to the right of the dam if failure or overtopping occurs. Previous overtopping events have cased erosion damage to the said property. In order to properly assess the impacts of various storms to the residence at the right abutment, a detailed hydraulic/hydrologic study should be completed.

The project team is currently proceeding with a study to assess the hazard classification of Mill Pond Dam.

3.3 Hydraulic/Hydrologic Data

Mill Pond Dam is a **Low** hazard structure and in accordance with current state dam safety regulations, the spillway design flood (SDF) for the site is the 50-year storm event. No detailed hydraulic and hydrologic analysis has been completed for the dam. According to the 2009 Stephens Associates Dam Evaluation Report, NHDES performed an informal H&H analysis of the dam in 2008. The following table summarizes the results of the NHDES H&H analysis.

Table 3.2: NHDES H&H Analysis

Storm Event	Inflow (cfs)	Peak El. (ft)	Spillway Discharge (cfs)		Discharge with operations (cfs)	
			With 1 ft freeboard	At top of Dam	With 1 ft freeboard	At top of Dam
50-year	1,452	14.0	385	1,110	618	1,360
100-year	1,833	14.4				

According to the NHDES analysis, with one foot of freeboard, the spillway can pass 385 cfs and, with operations, can pass 618 cfs. The inflow for the 50-year flood was 1452 cfs and for the 100-year flood was 1,833 cfs. Based on that information, the dam cannot pass the SDF with one-foot of freeboard. However, NHDES assumed a spillway length of 110 feet, instead of the shortened spillway length of approximately 100-feet due to the fish ladder installation in 1975.

Weston & Sampson, under contract with VHB, Inc., completed a draft analysis currently under review by NHDES. The following table summarizes the preliminary data.

Table 3.2: Draft W&S H&H Analysis

Storm Event	Inflow (cfs)	Peak El. (ft)	Spillway Discharge (cfs)	
			With 1 ft freeboard	At top of Dam
50-year	3,352	14.62	352	1,015
100-year	3,877	15.04		

Based on the updated results, the dam will be overtopped on the right abutment by 1.74 feet and cannot pass the 50-year storm with one-foot of freeboard.

3.4 Structural and Seepage Stability

A structural stability analysis was performed by Stephens Associates as part of the 2009 Inspection Report. No records of the original design computations were available for review at the time of the preparation of this report.

3.4.1 Structural Stability of Dam

Stephens Associates completed a structural stability analysis as part of the 2009 Inspection report. The following table summarizes the results of that analysis:

Table 3.3: Results of Stability Analysis

Case	FS for Sliding	Eccentricity (ft)	Maximum Bearing Pressure (psf)
Spillway – Normal Flow	2.0	0.33	7,300
Spillway – Flood	2.2	1.14	9,500
Right Abutment – Normal Flow	1.7	1.3	1,030
Right Abutment – Flood	1.4	2.3	840
Right Abutment – Ice and Normal Flow	<1	6.4	1,040

According to NHDES Env-Wr 303.12(c)(2), the stability analysis shall follow the methods outlined in “Engineering Guidelines for Evaluation of Hydropower Projects” published by the Federal Energy Regulatory Commission (FERC) Chapter 3 dated 2002 and Chapter 4 dated 1991. The guidelines mentioned state that a minimum factor of safety of 1.5 must be met for the worst static load case.

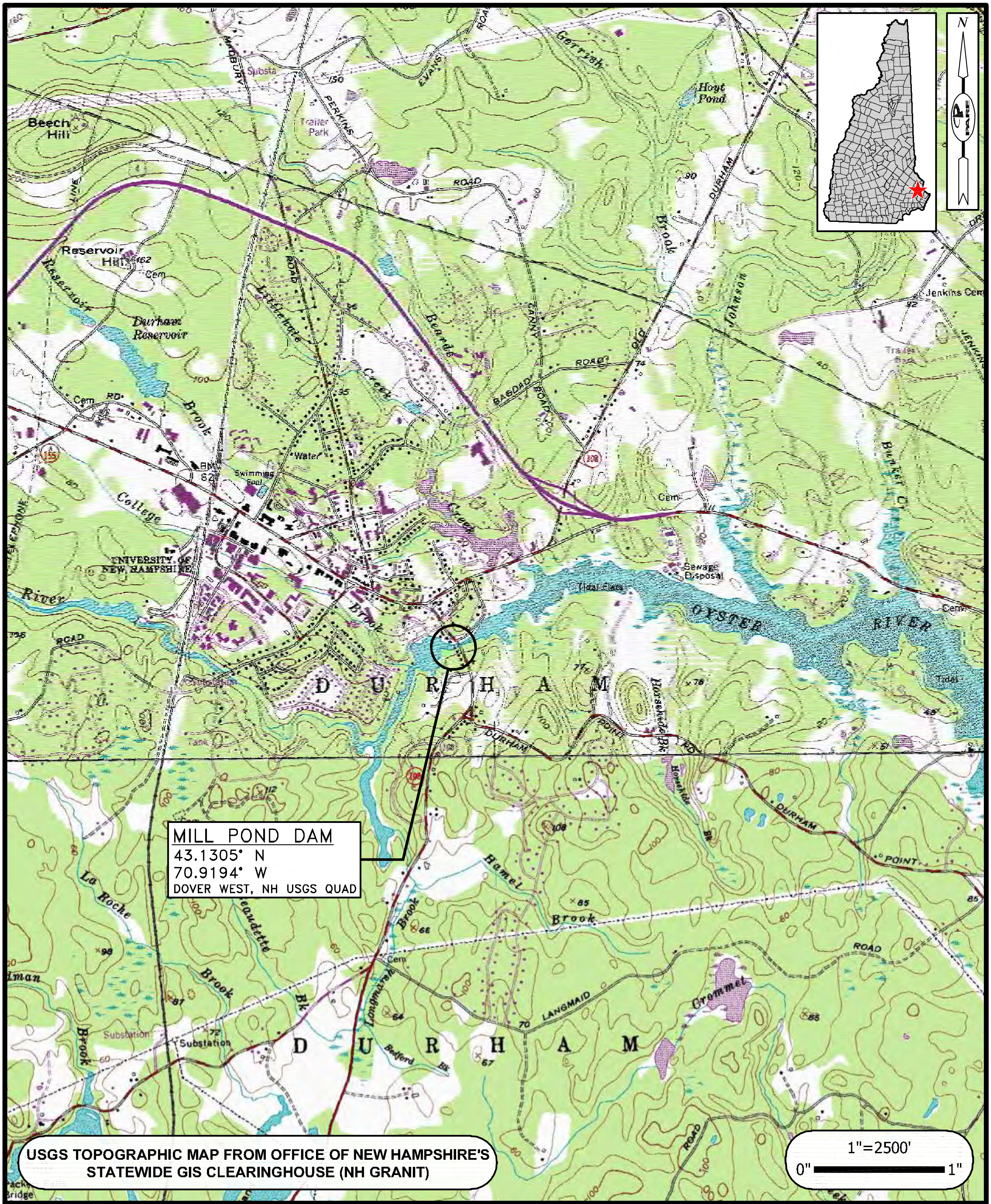
The results show that the spillway is stable against flood conditions and the spillway and right abutment (gated outlet structure) are stable against normal flow conditions. The right abutment does not meet the factor of safety of 1.5 for the flood and normal pool with ice conditions.

The downstream masonry wall and right abutment masonry wall are generally vertical. The right abutment masonry wall was reconstructed in 2009 after a storm event overtopped the right abutment and washed out the previous masonry wall. The right abutment masonry wall is slightly bulging, but appears to be stable. The spillway continues to deteriorate with section loss through the rib between cell 1 and 2. The section loss was not apparent during the inspection in 2009.

3.4.2 Seepage Stability

No formal seepage analyses have been completed for this structure. Seepage and orange staining were observed at the bottom of the masonry walls along the right abutment and through the downstream side of the outlet structure. It is unknown whether the seepage through the right abutment masonry wall is due to potentially high water table right of the dam or from the dam impoundment. Two areas of seepage were noted through the concrete of the outlet structure. Orange staining and ice buildup was also noted on the downstream side of the low level outlet structure, potentially indicating additional seepage through the structure.

Orange staining and ice apparently from cracks were noted within some of the spillway cells. No active seepage was present during the time of the inspection; however, active seepage was previously noted within Cell No. 1 on the connecting low level outlet wall and within Cell No. 2 on the right wall as indicated within the inspection report by NHDES dated September 18, 2017.



MILL POND DAM
43.1305° N
70.9194° W
DOVER WEST, NH USGS QUAD

USGS TOPOGRAPHIC MAP FROM OFFICE OF NEW HAMPSHIRE'S STATEWIDE GIS CLEARINGHOUSE (NH GRANIT)

1"=2500'
0" 1"

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MILL POND DAM

DAM #071.03

DURHAM, NEW HAMPSHIRE

OWNER - TOWN OF DURHAM

LOCUS PLAN

MARCH 2020

FIGURE 1

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MILL POND DAM

DAM #071.03

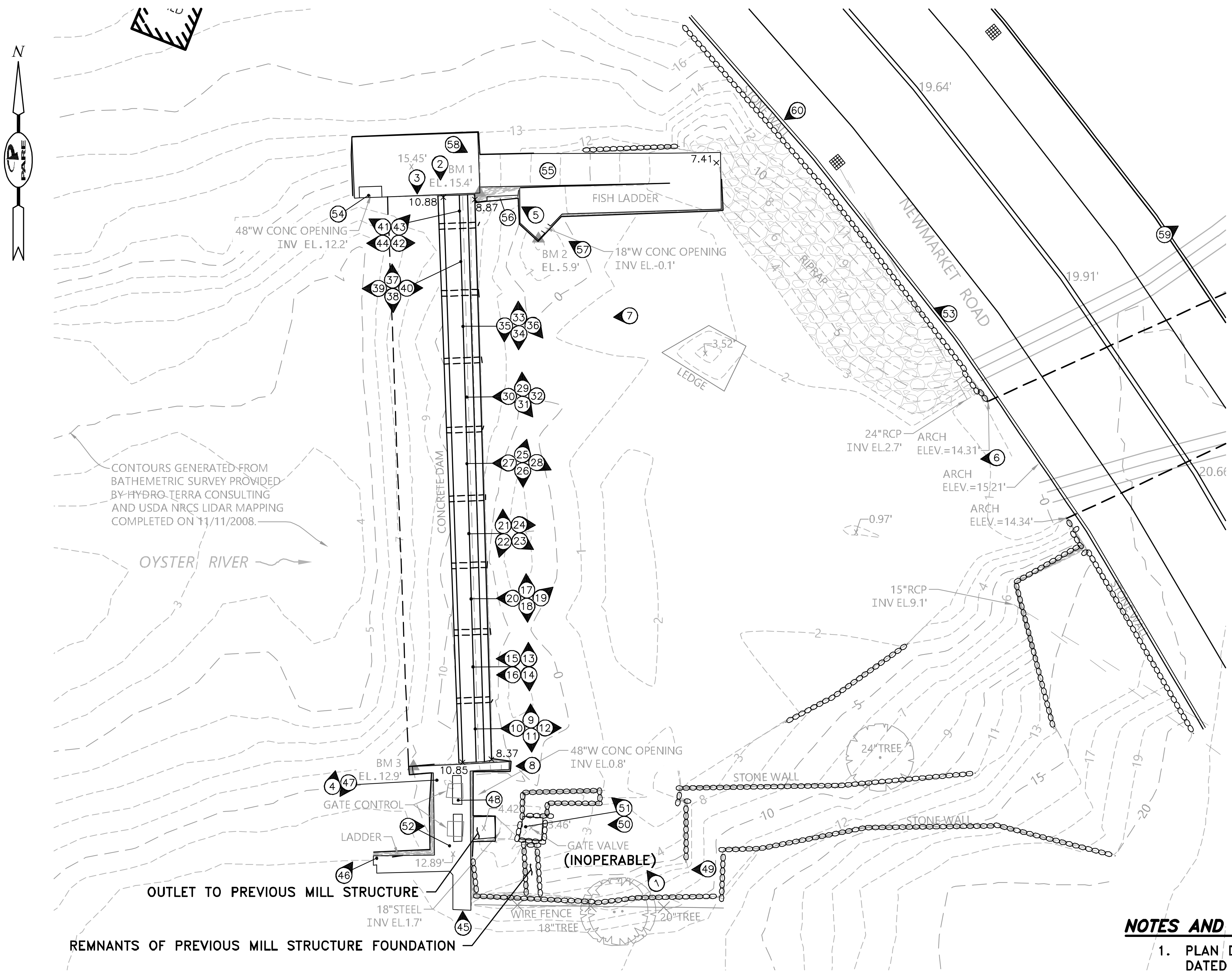
DURHAM, NEW HAMPSHIRE

OWNER - TOWN OF DURHAM

AERIAL PLAN

MARCH 2020

FIGURE 2



SITE SKETCH

SCALE: 1"=20'±

NOTES AND LEGEND

1. PLAN DEVELOPED FROM A SURVEY PLAN PREPARED BY VHB, INC. DATED DECEMBER 18, 2019 AND NOTES TAKEN DURING THE INSPECTION. INFORMATION IS PROVEDED FOR REFERENCE PURPOSES ONLY.
2. ELEVATIONS REFERENCE THE NAVD 88 VERTICAL DATUM.

×3.0 SPOT ELEVATION AS DETERMINED BY VHB, INC. REFERENCING EITHER BM 1, BM 2, OR BM 3.

◀# DENOTES APPROXIMATE LOCATION AND DIRECTION OF PHOTOGRAPH.

Y:\JOBS\19 Jobs\19169.00 VHB-OysterRiver-Mill Pond Dam Feasibility-MA\dwgs\FIG 3 Site Sketch.dwg

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SCALE ADJUSTMENT
GUIDE
0" 1"
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MILL POND DAM
DAM #071.03
DURHAM, NEW HAMPSHIRE
OWNER: TOWN OF DURHAM

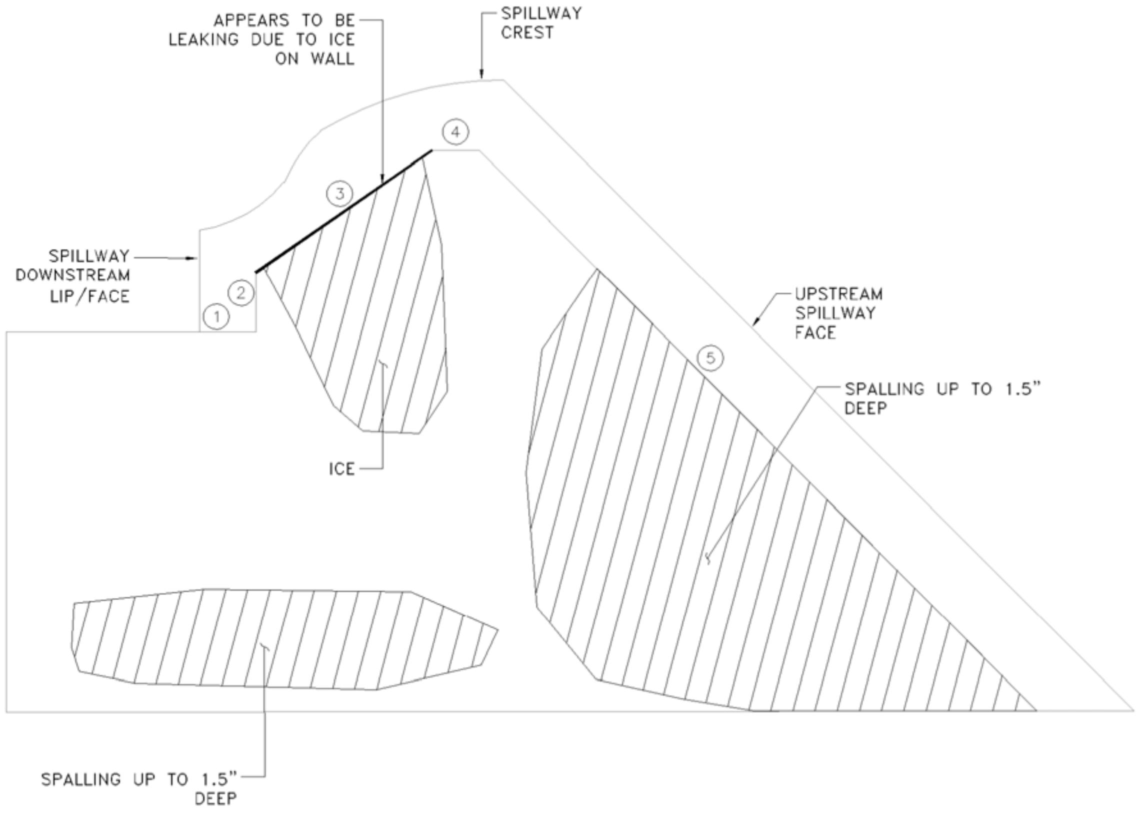
REVISIONS:

PROJECT NO.:	19169.00
DATE:	MARCH 2020
SCALE:	AS NOTED
DESIGNED BY:	HMS
CHECKED BY:	ARO
DRAWN BY:	LMC
APPROVED BY:	ARO

SITE
SKETCH

FIGURE NO.:
3

APPENDIX A
Spillway Cell Inspection Figures
Mill Pond Dam
Durham, NH



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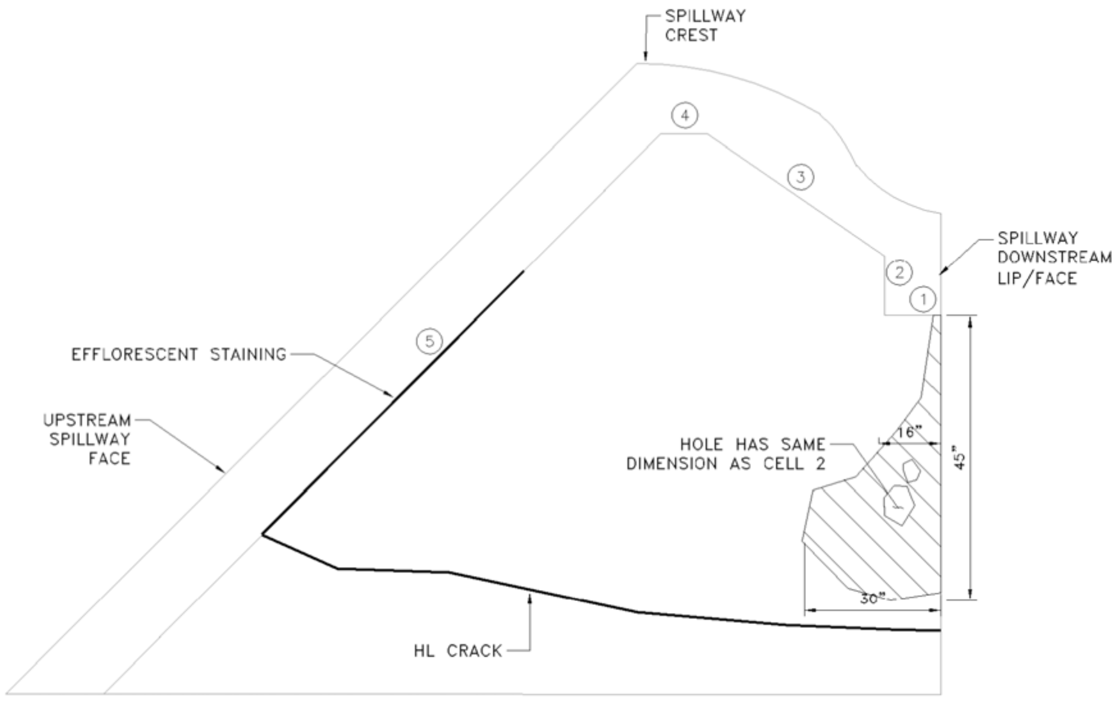

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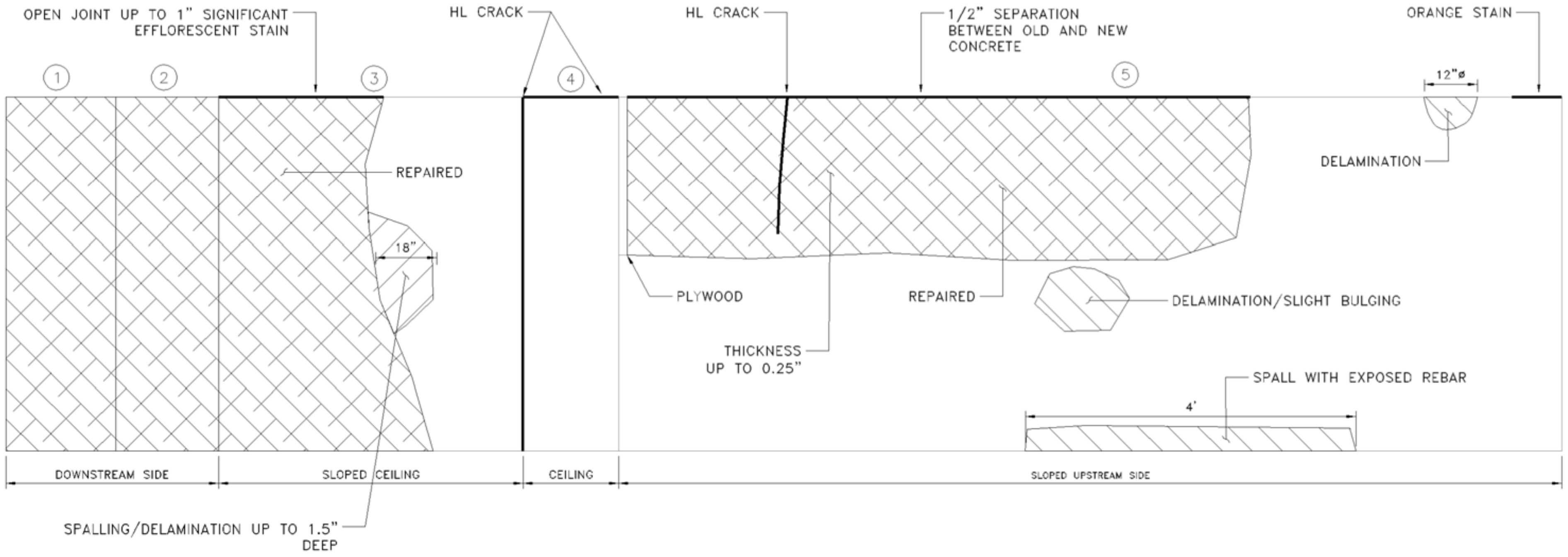

UPSTREAM WALL AND CEILING OF CELL

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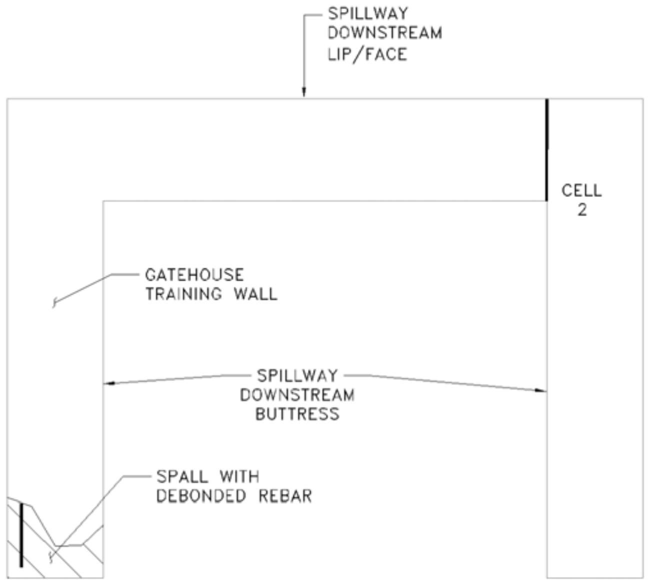

SPILLWAY DOWNSTREAM FACE AND BUTTRESSES

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MILL POND DAM FEASIBILITY STUDY

DURHAM, NH

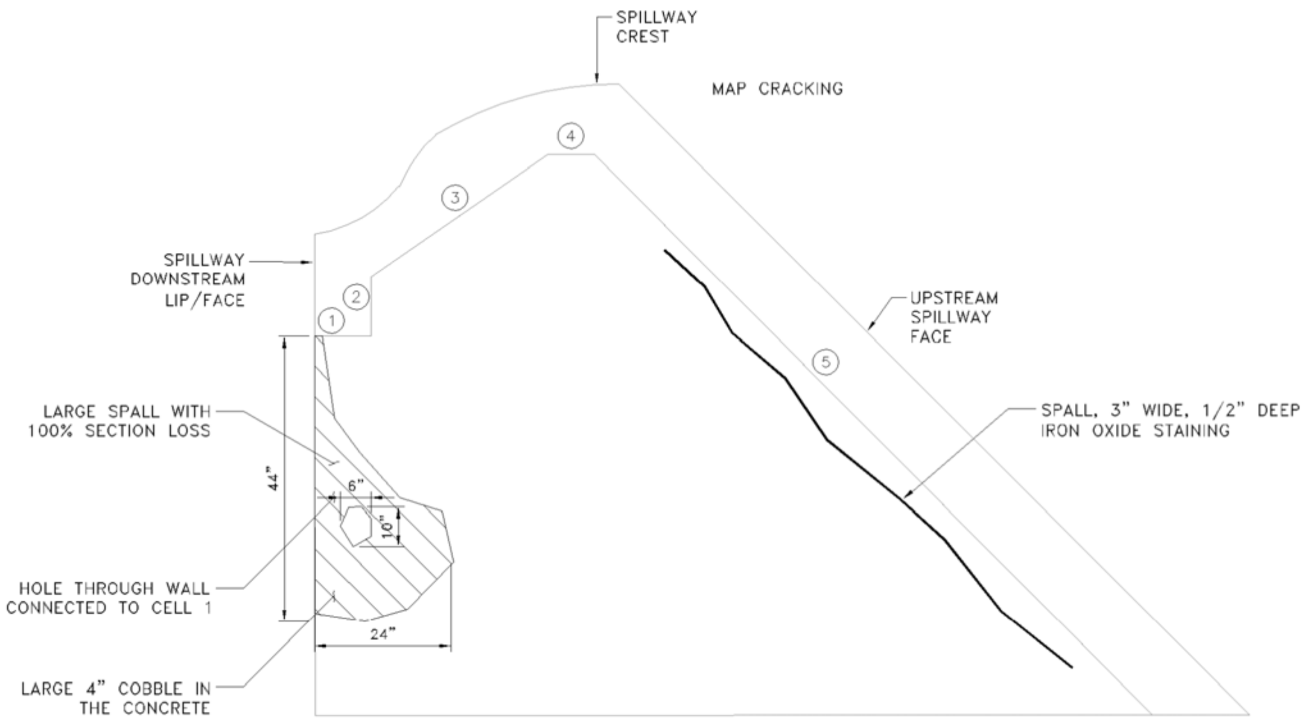
OWNER: TOWN OF DURHAM

REVISIONS:

PROJECT NO.: 19169.00
DATE: DEC 2019
SCALE: NTS
DESIGNED BY: HMS
CHECKED BY:
DRAWN BY: HMS
APPROVED BY:

CELL NO. 1

SHEET NO.: 1



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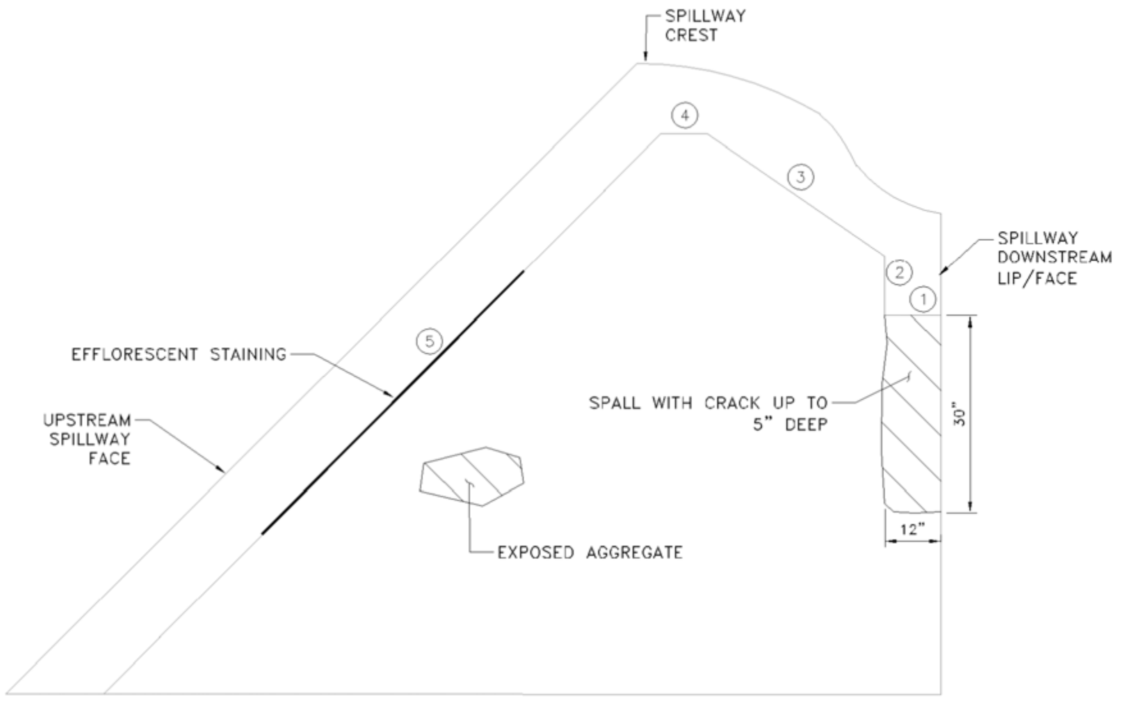

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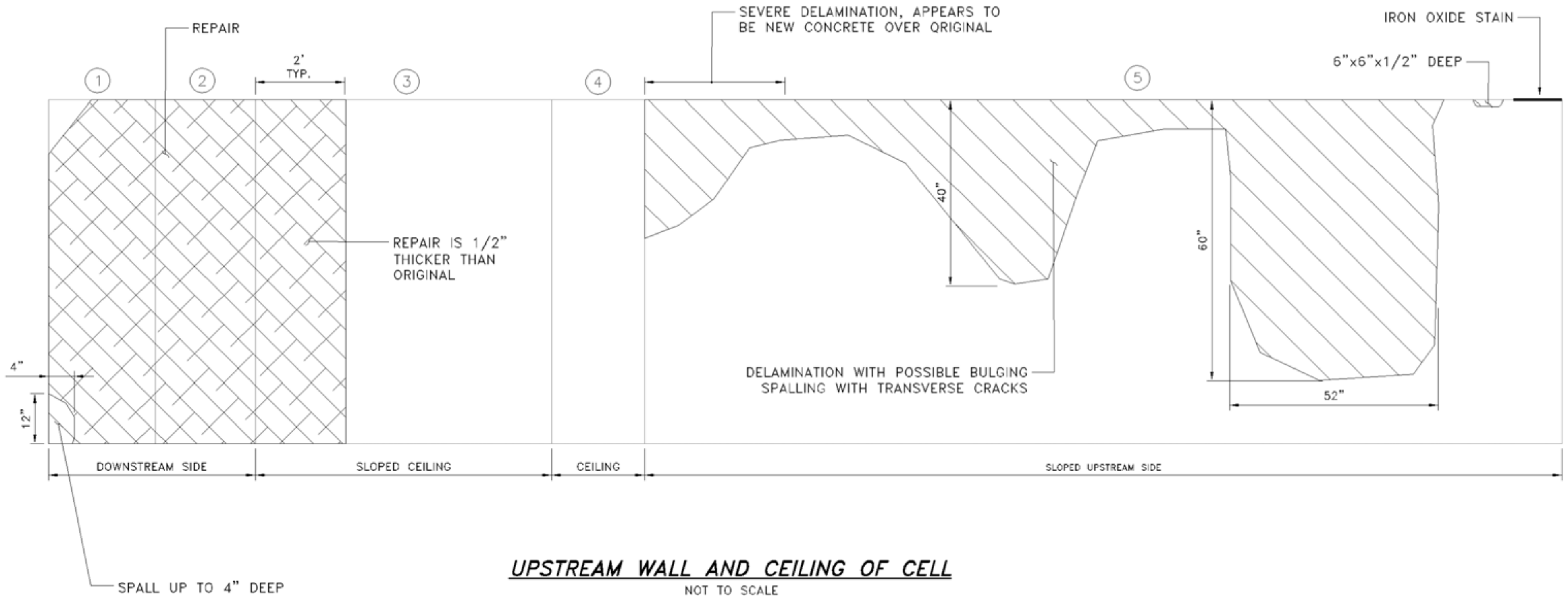

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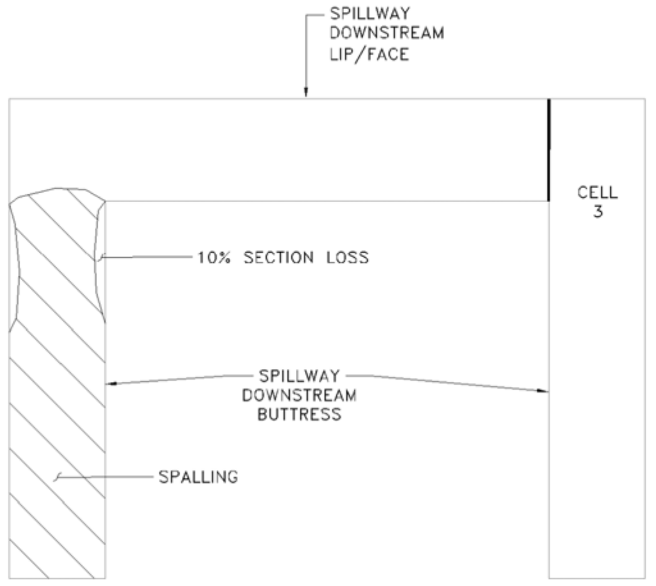

SPILLWAY DOWNSTREAM FACE AND BUTTRESSES

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CELL NO. 2

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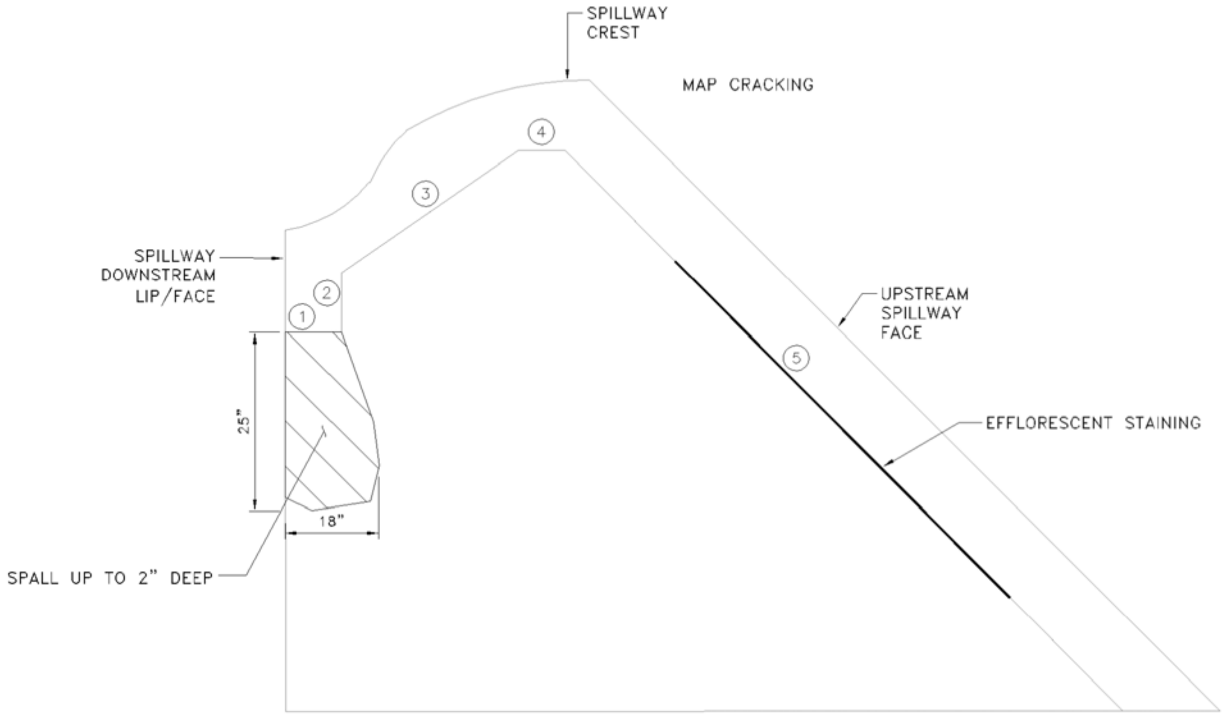

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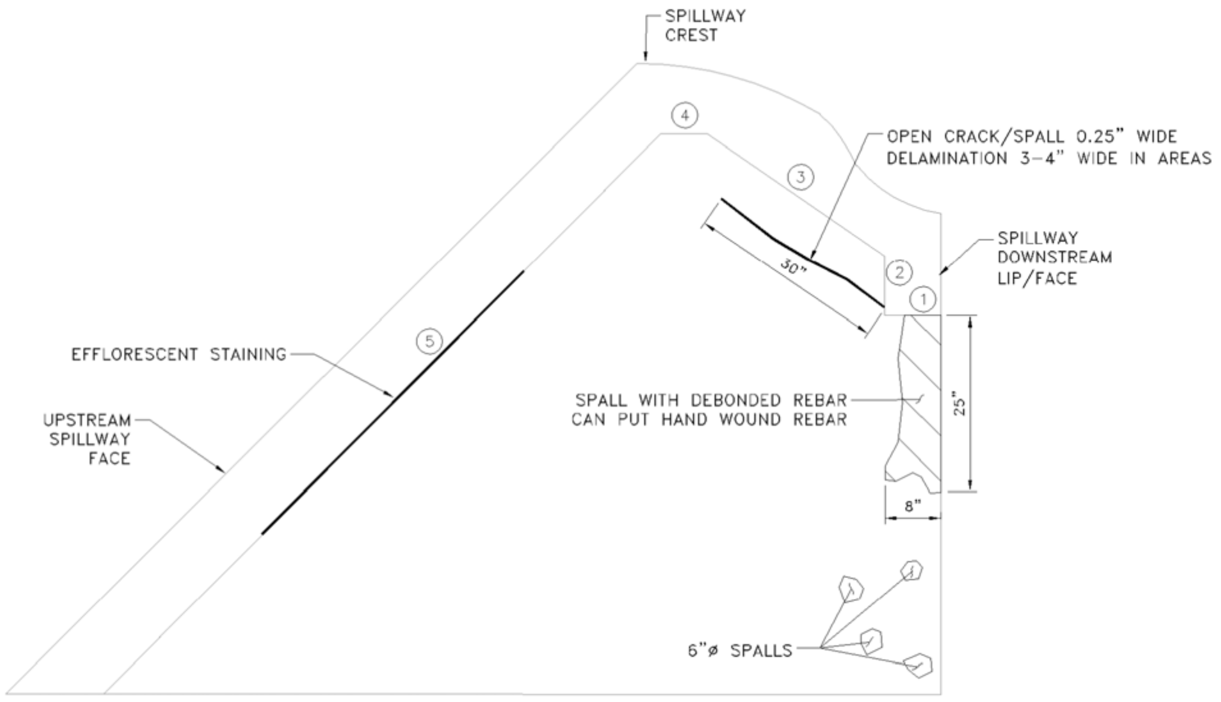

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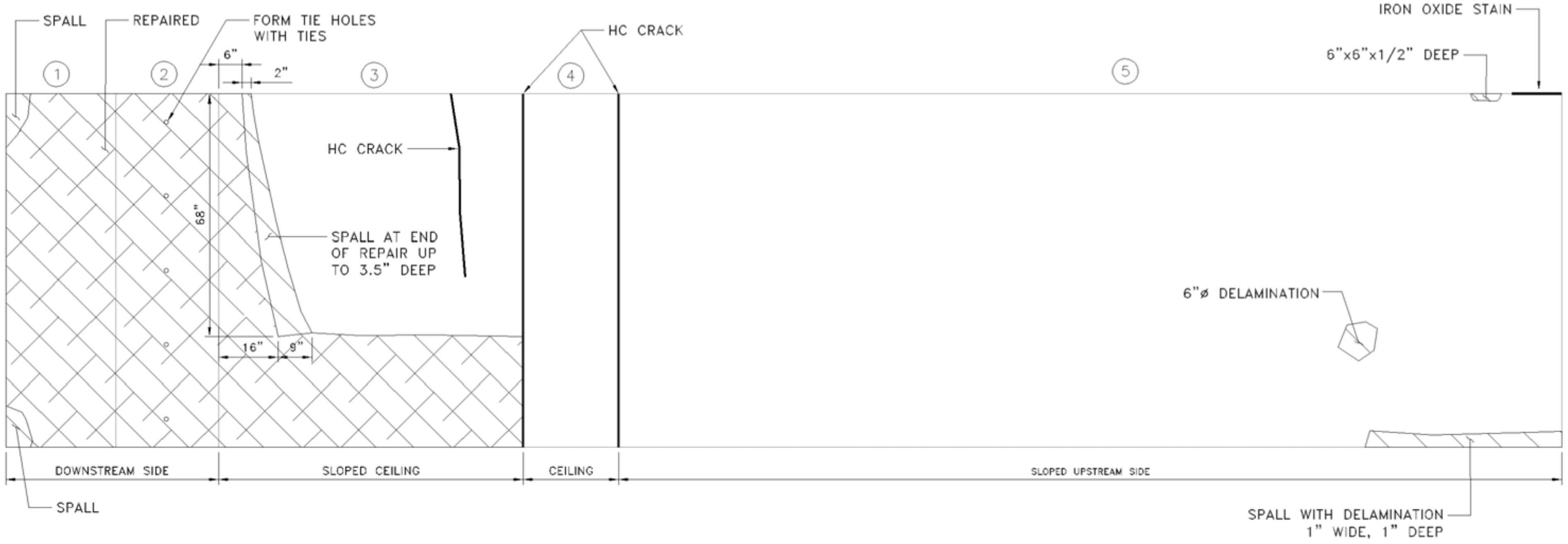

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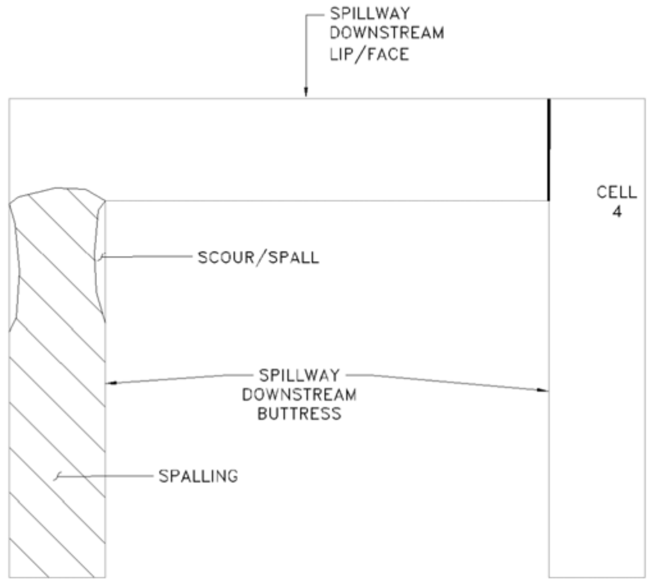

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CELL NO. 3

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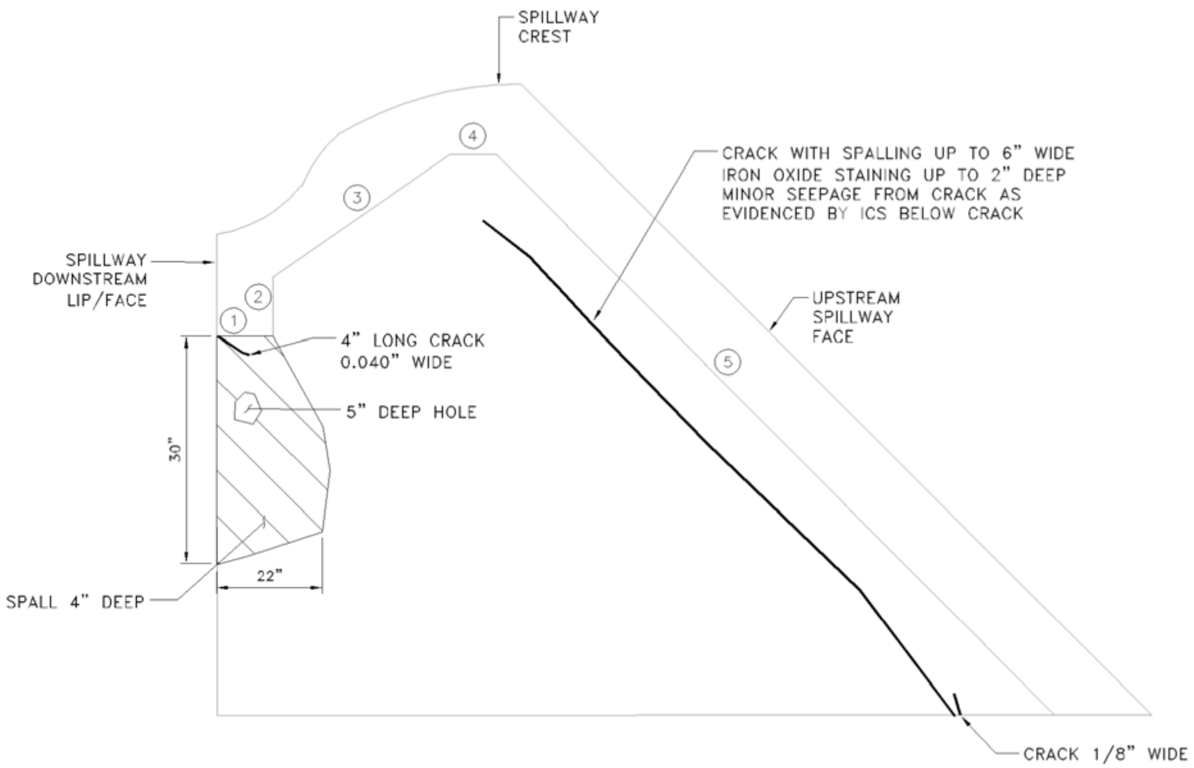

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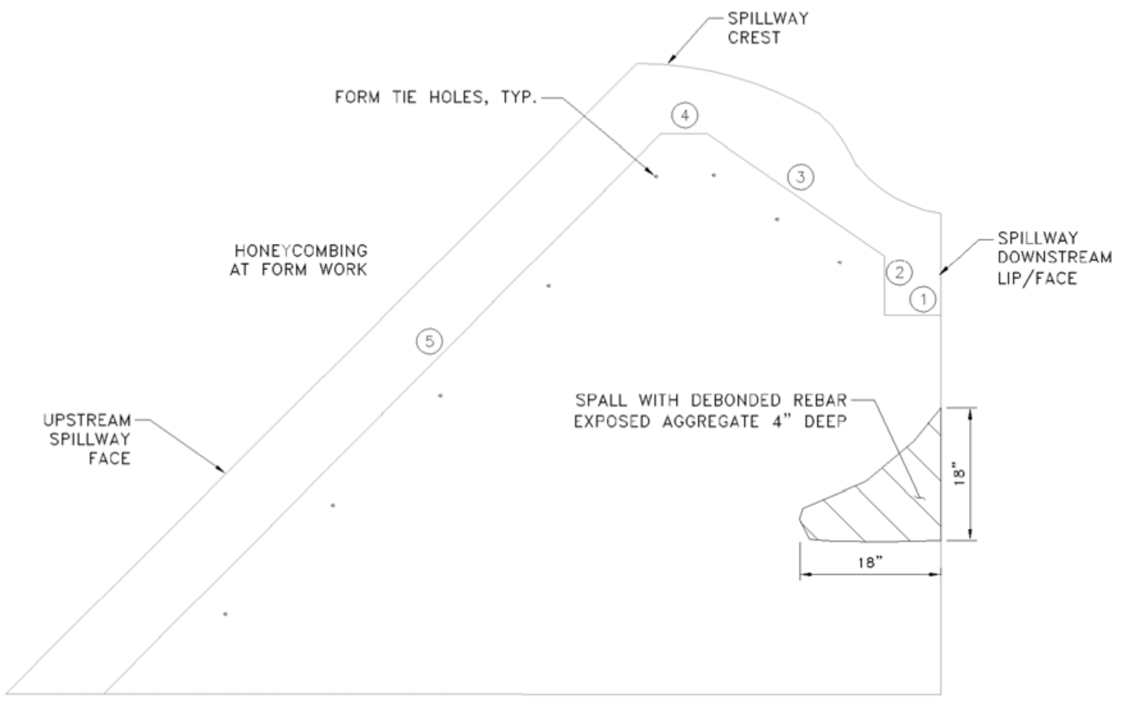

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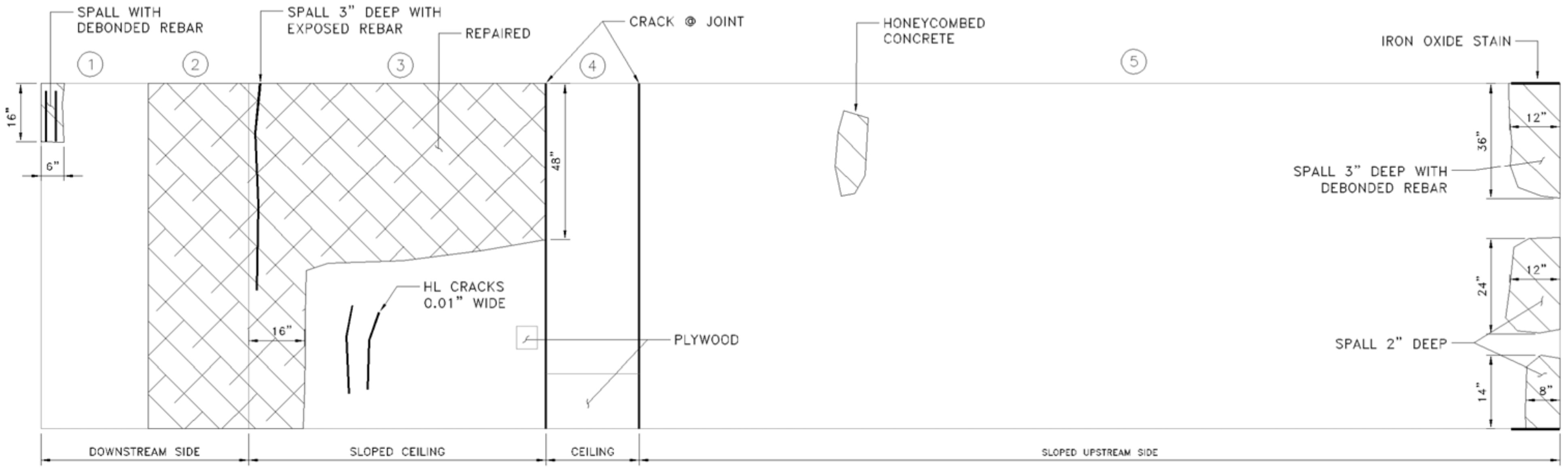

UPSTREAM WALL AND CEILING OF CELL

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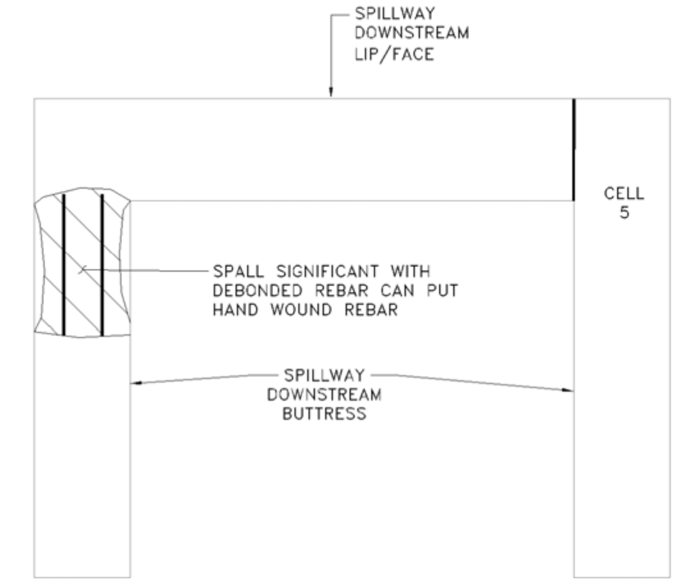

SPILLWAY DOWNSTREAM FACE AND BUTTRESSES

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REVISIONS:

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CELL NO. 4

SHEET NO.:
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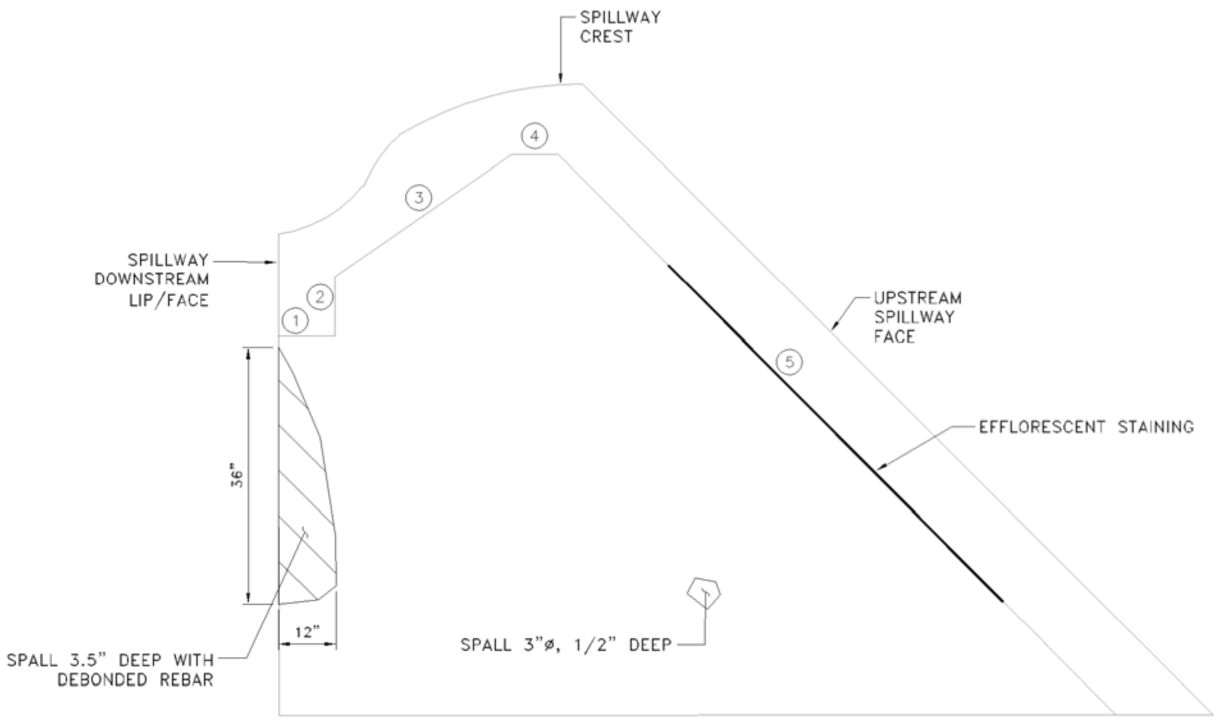

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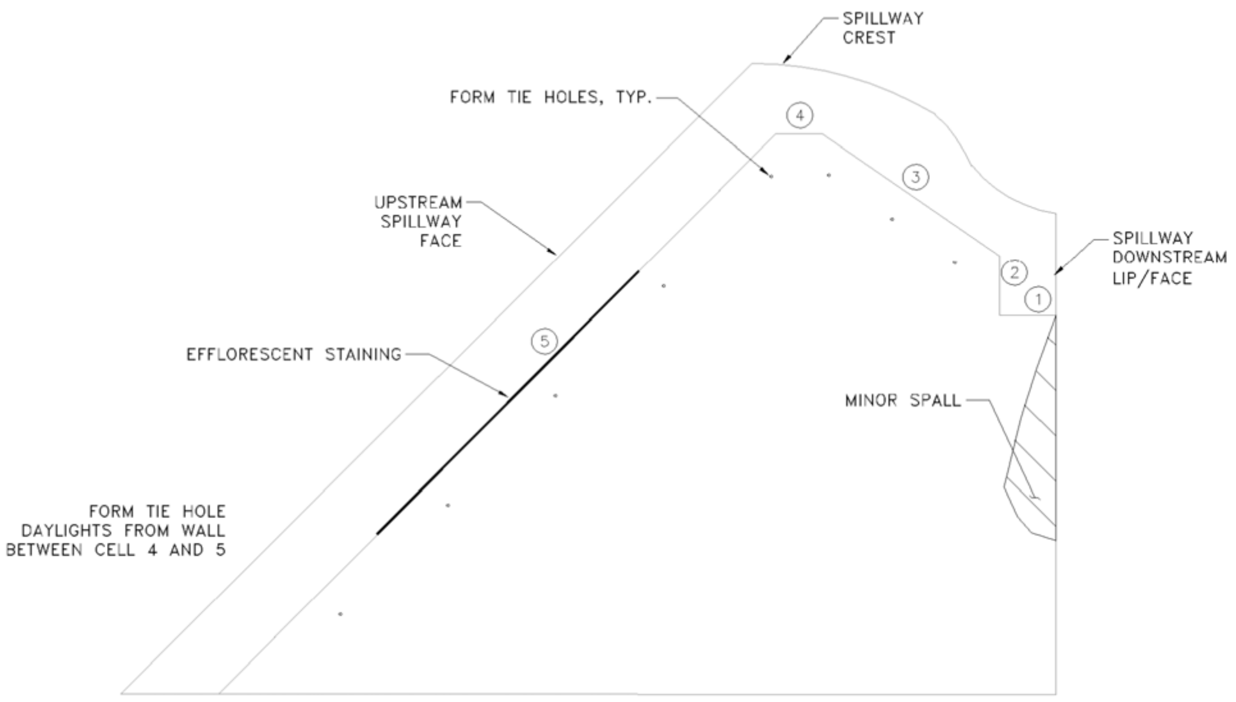

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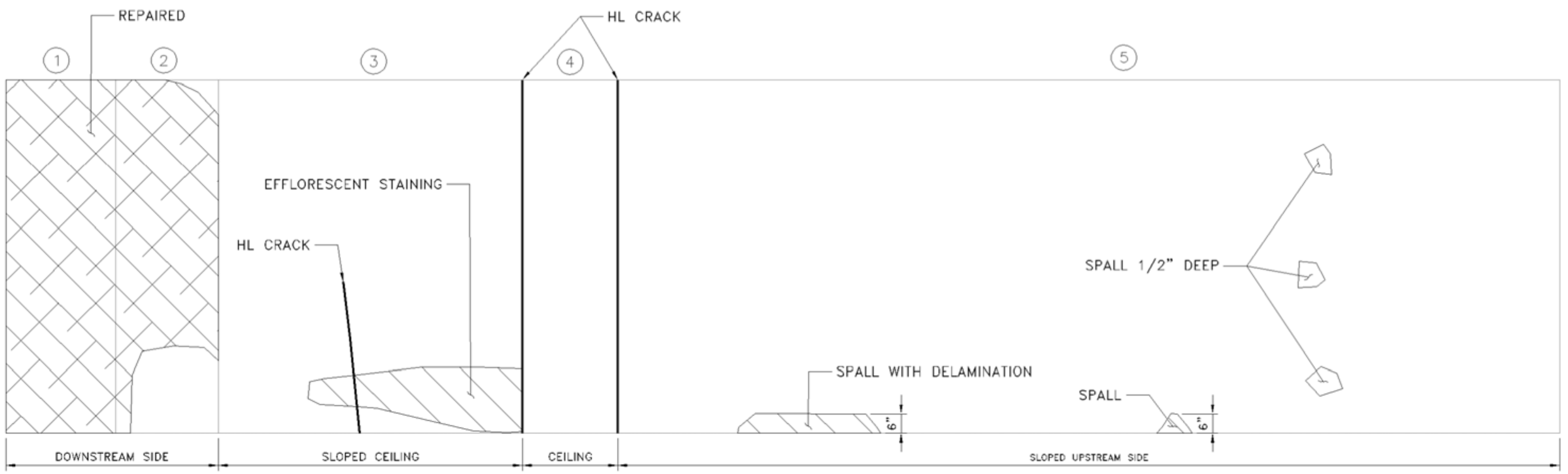

UPSTREAM WALL AND CEILING OF CELL

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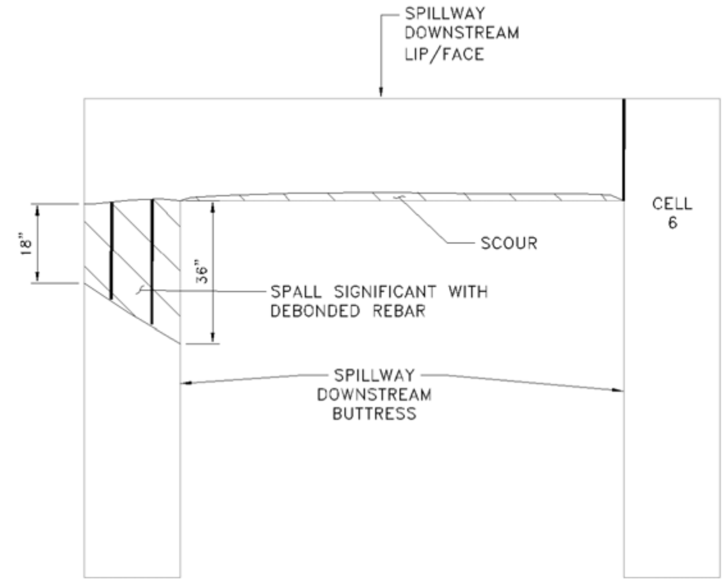

SPILLWAY DOWNSTREAM FACE AND BUTTRESSES

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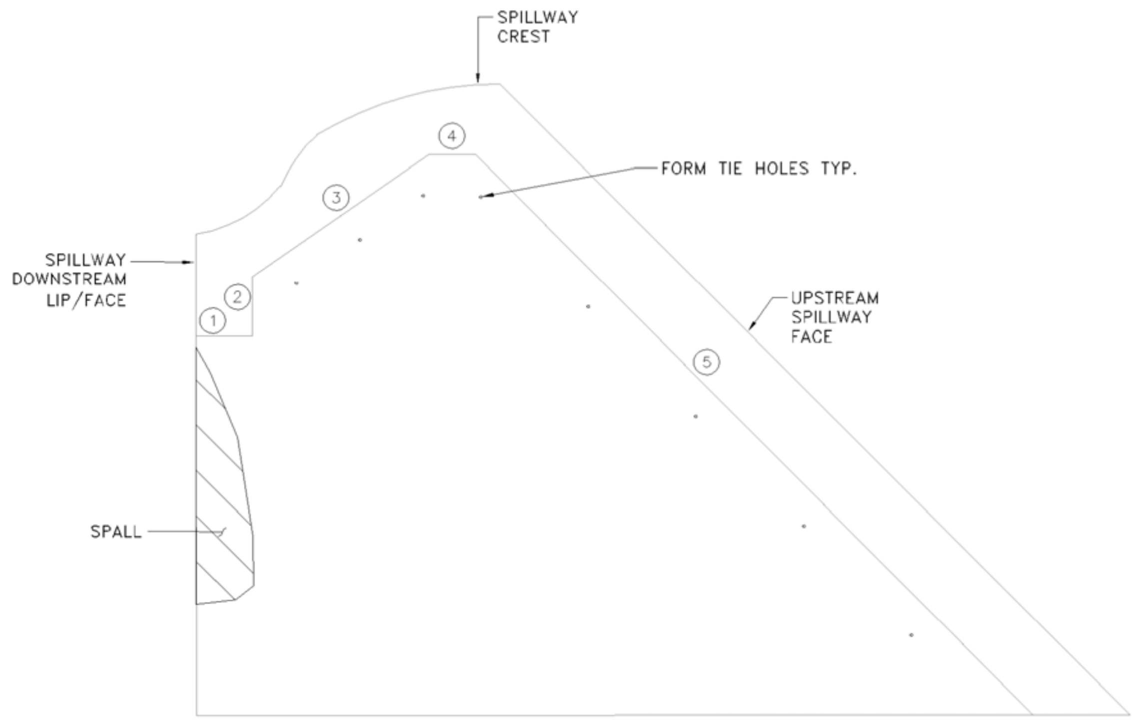
PROJECT NO.:	19169.00
DATE:	DEC 2019
SCALE:	NTS
DESIGNED BY:	HMS
CHECKED BY:	
DRAWN BY:	HMS
APPROVED BY:	

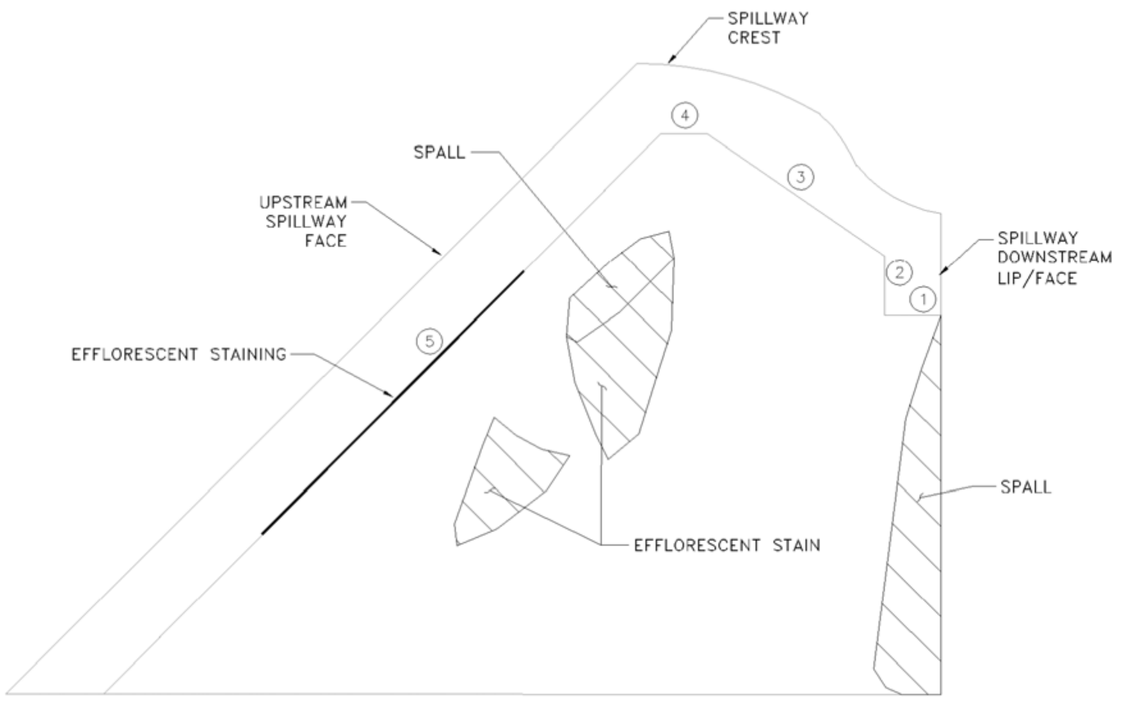
CELL NO. 5

SHEET NO.: 5



RIGHT CELL WALL

NOT TO SCALE



LEFT CELL WALL

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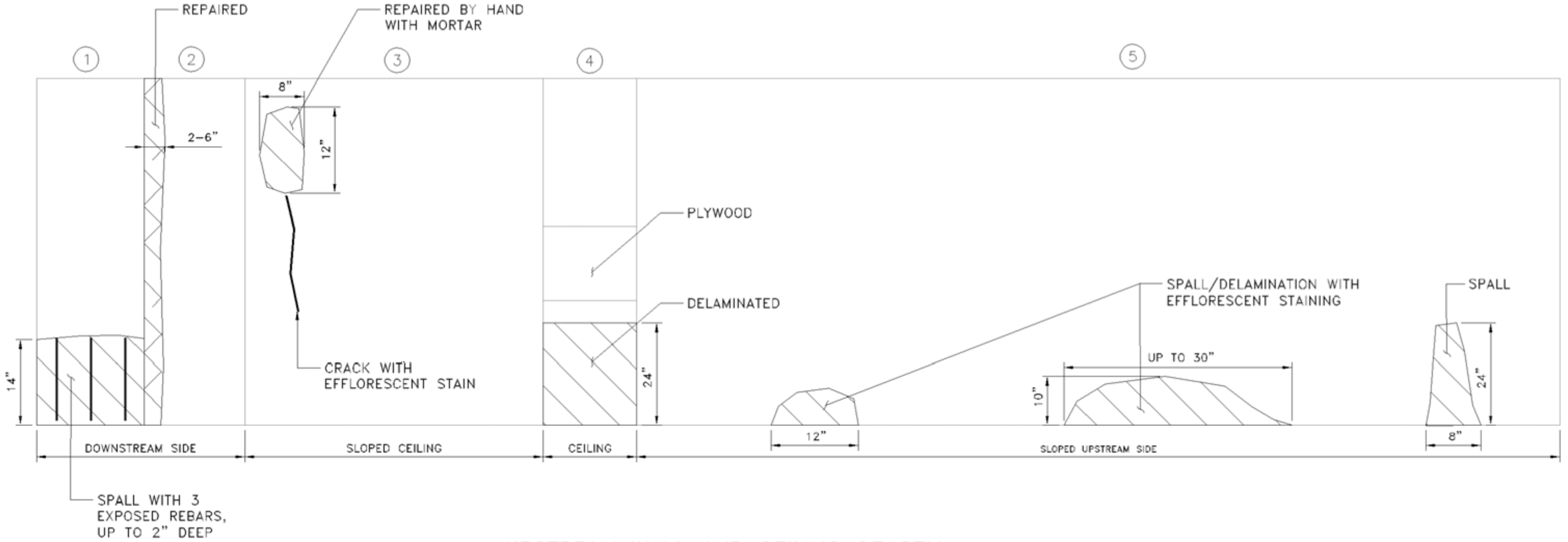
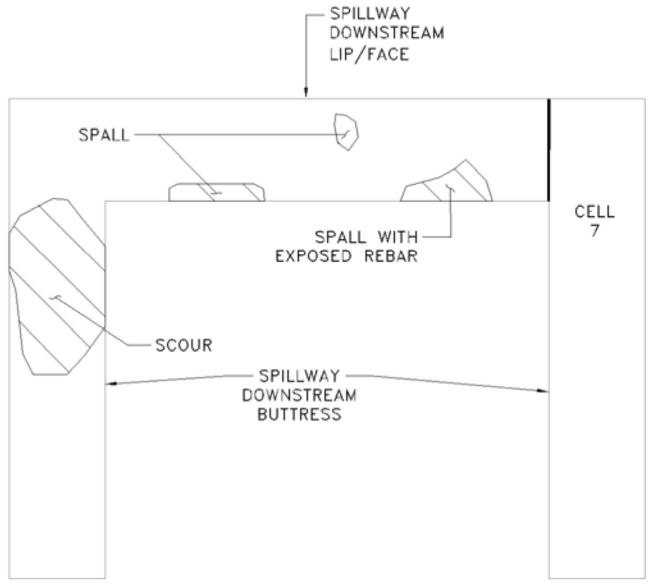


UPSTREAM WALL AND CEILING OF CELL

NOT TO SCALE



SPILLWAY DOWNSTREAM FACE AND BUTTRESSES

NOT TO SCALE

NOT FOR CONSTRUCTION

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FOXBORO, MA 02035
508-543-1755

SCALE ADJUSTMENT GUIDE
0" 1"
BAR IS ONE INCH ON ORIGINAL DRAWING.

MILL POND DAM FEASIBILITY STUDY

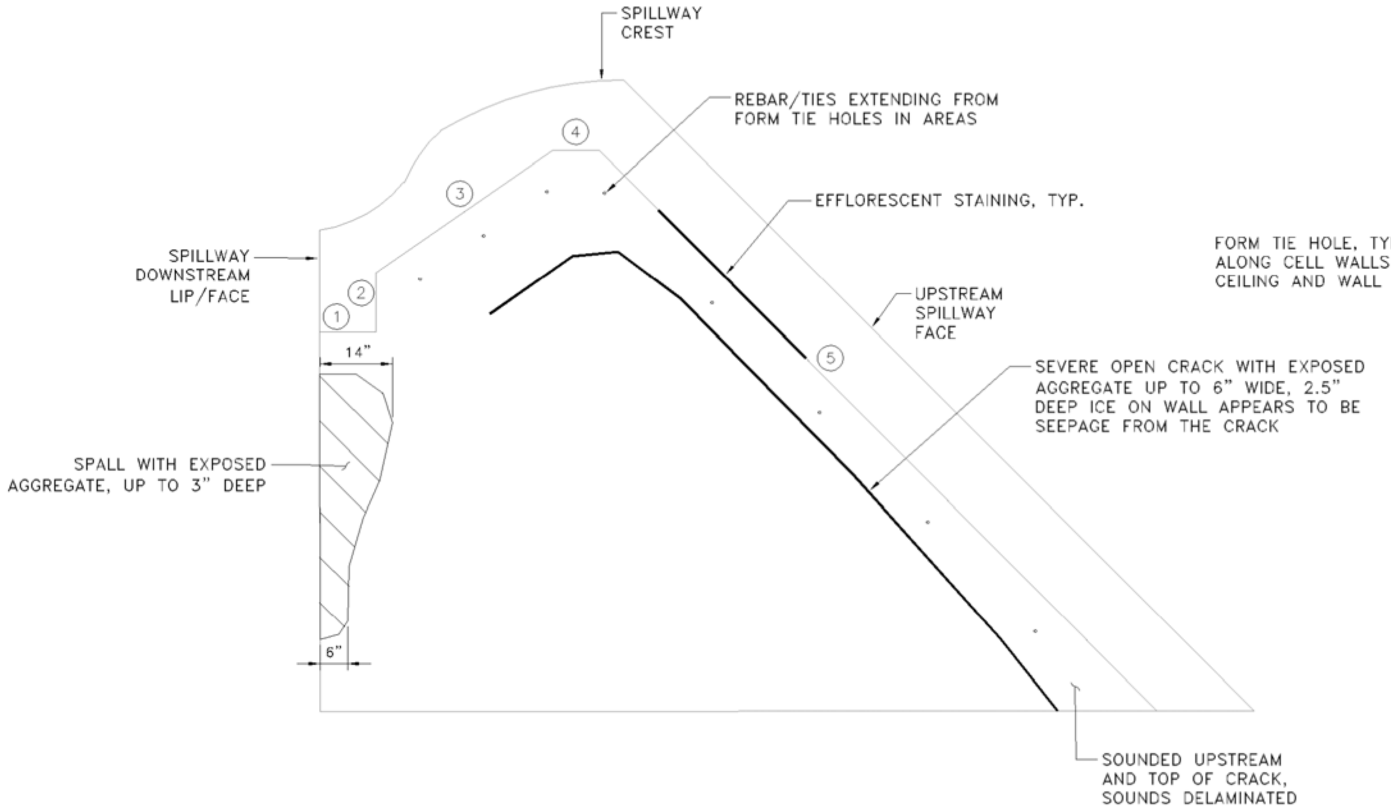
DURHAM, NH
OWNER: TOWN OF DURHAM

REVISIONS:

PROJECT NO.:	19169.00
DATE:	DEC 2019
SCALE:	NTS
DESIGNED BY:	HMS
CHECKED BY:	
DRAWN BY:	HMS
APPROVED BY:	

CELL NO. 6

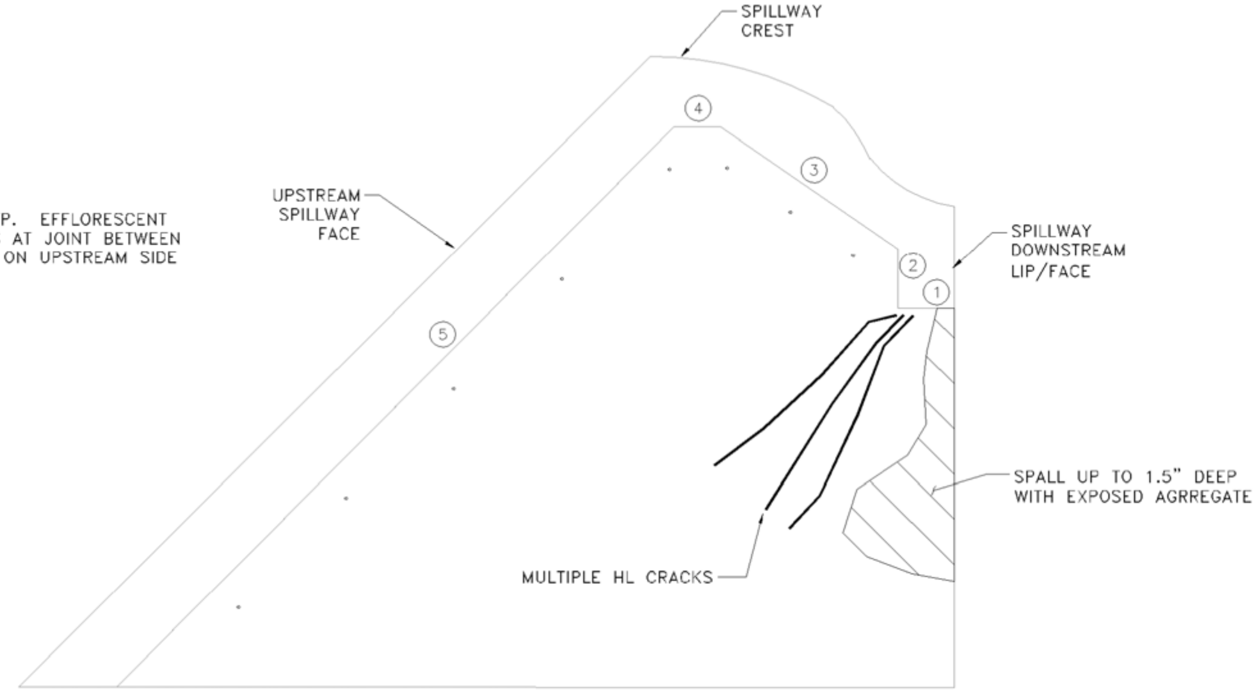
SHEET NO.: 6



FORM TIE HOLE, TYP. EFFLORESCENT ALONG CELL WALLS AT JOINT BETWEEN CEILING AND WALL ON UPSTREAM SIDE

RIGHT CELL WALL

NOT TO SCALE



LEFT CELL WALL

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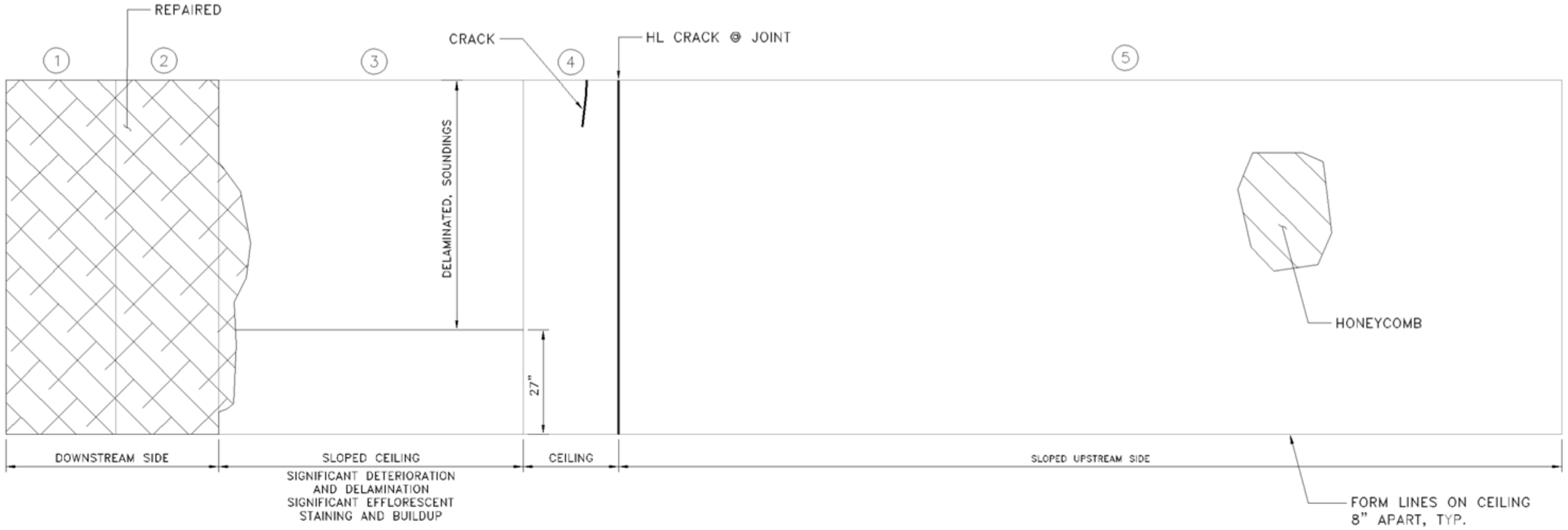
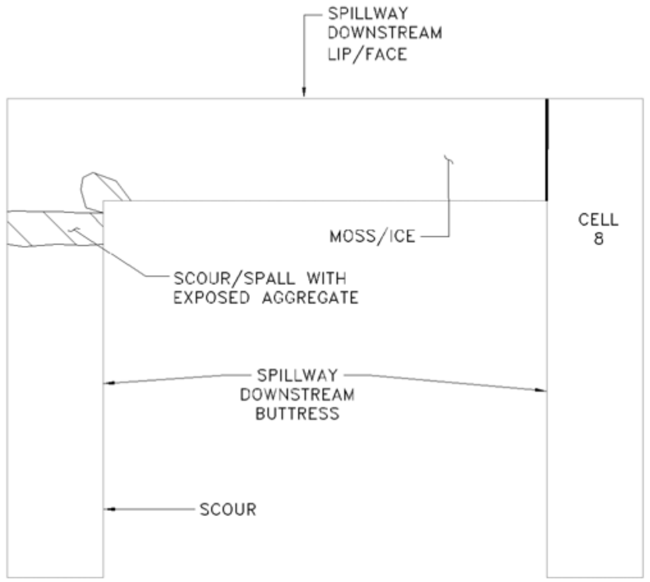


UPSTREAM WALL AND CEILING OF CELL

NOT TO SCALE



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MILL POND DAM FEASIBILITY STUDY

DURHAM, NH
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SCALE:	NTS
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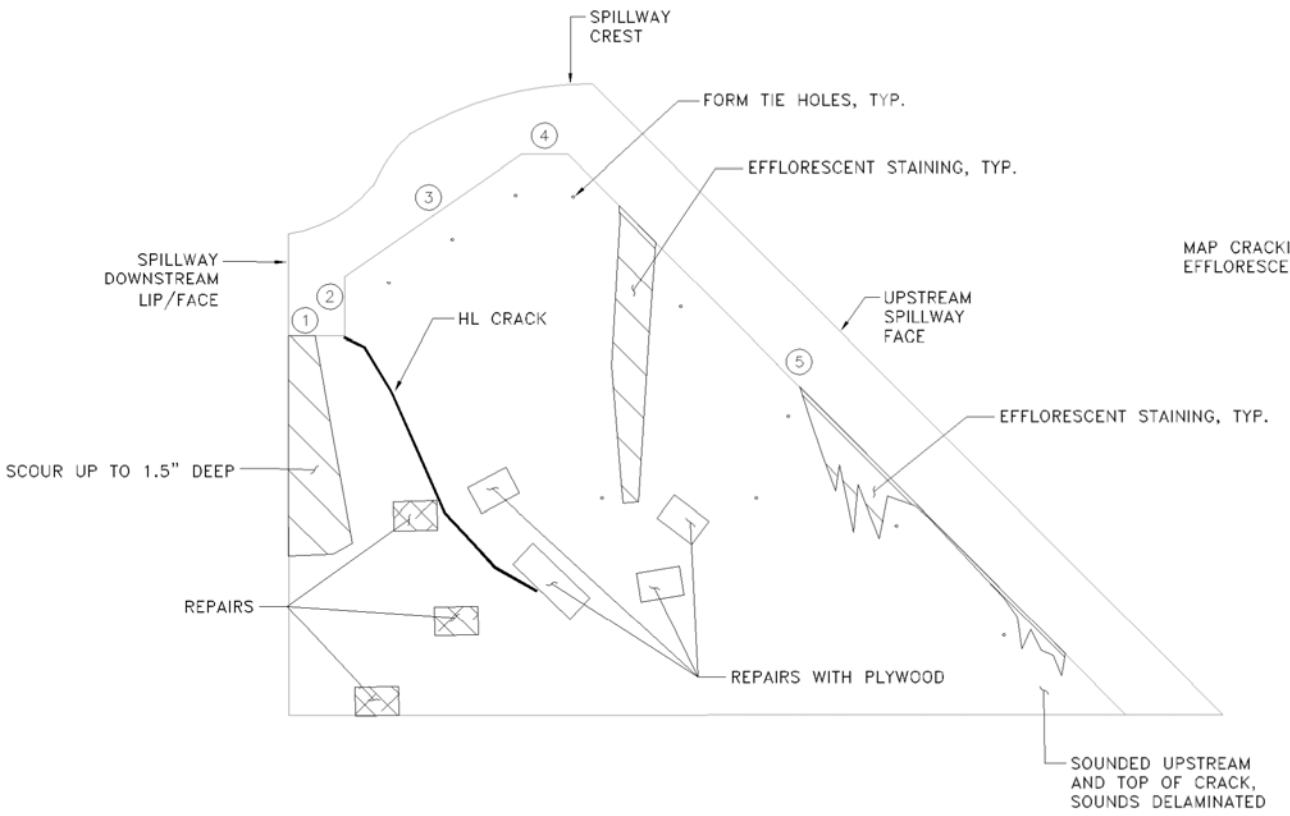
DRAWN BY:	HMS
APPROVED BY:	

CELL NO. 7

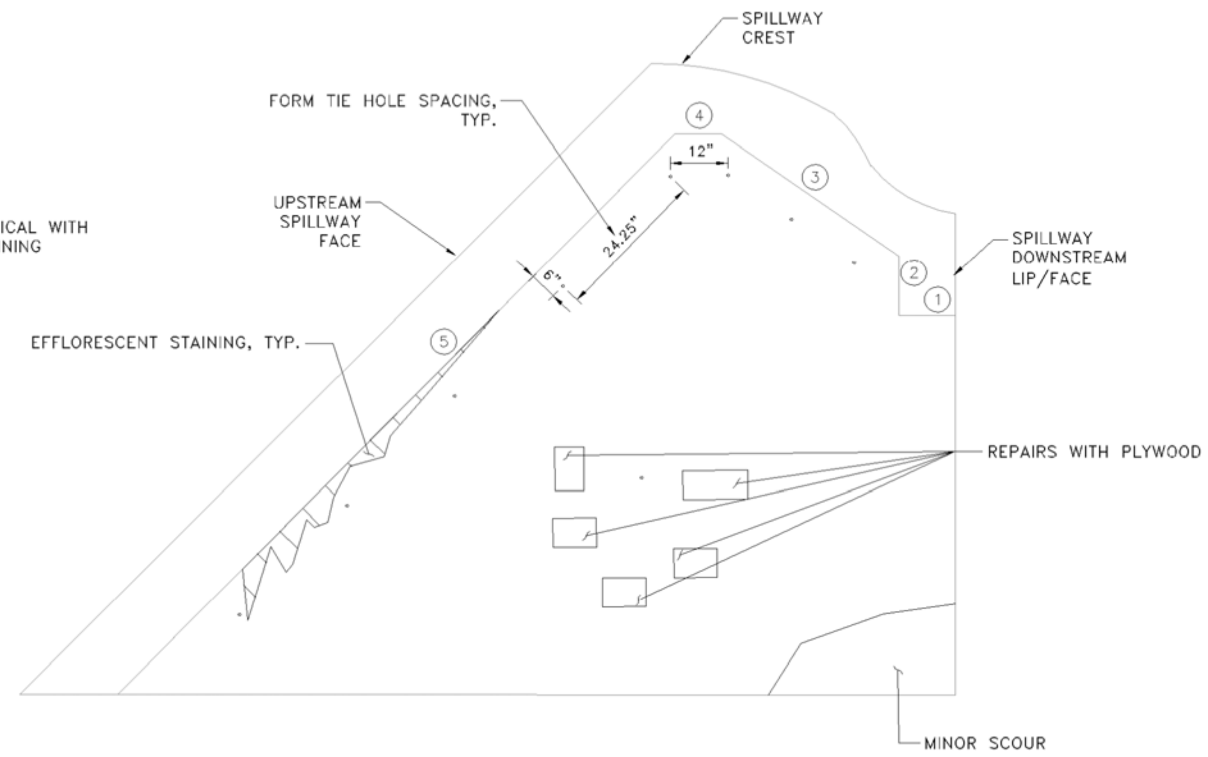
SHEET NO.: 7



RIGHT CELL WALL

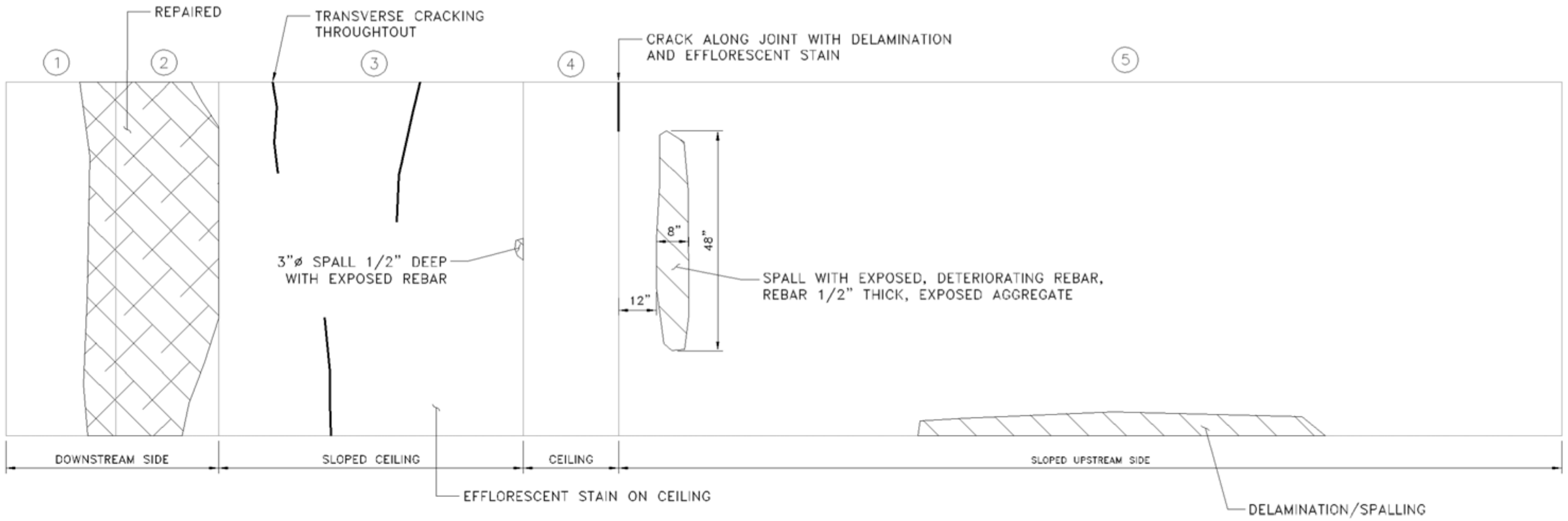
NOT TO SCALE

MAP CRACKING TYPICAL WITH EFFLORESCENT STAINING



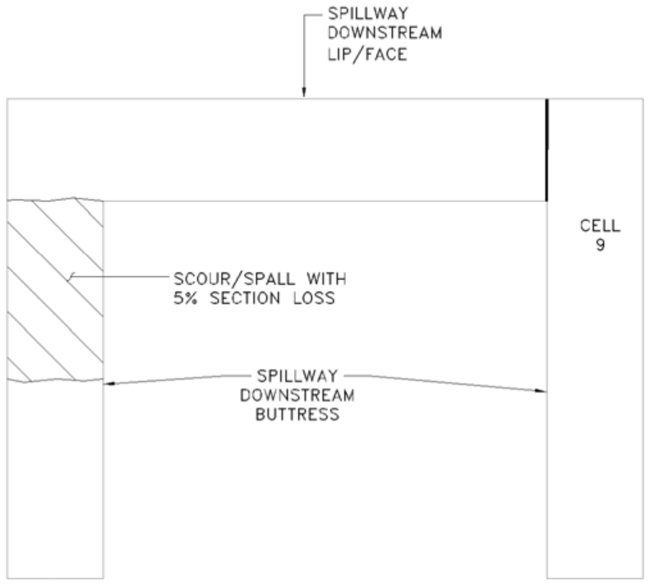
LEFT CELL WALL

NOT TO SCALE



UPSTREAM WALL AND CEILING OF CELL

NOT TO SCALE



SPILLWAY DOWNSTREAM FACE AND BUTTRESSES

NOT TO SCALE

NOT FOR CONSTRUCTION

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MILL POND DAM FEASIBILITY STUDY

DURHAM, NH
OWNER: TOWN OF DURHAM

REVISIONS:

PROJECT NO.:	19169.00
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SCALE:	NTS
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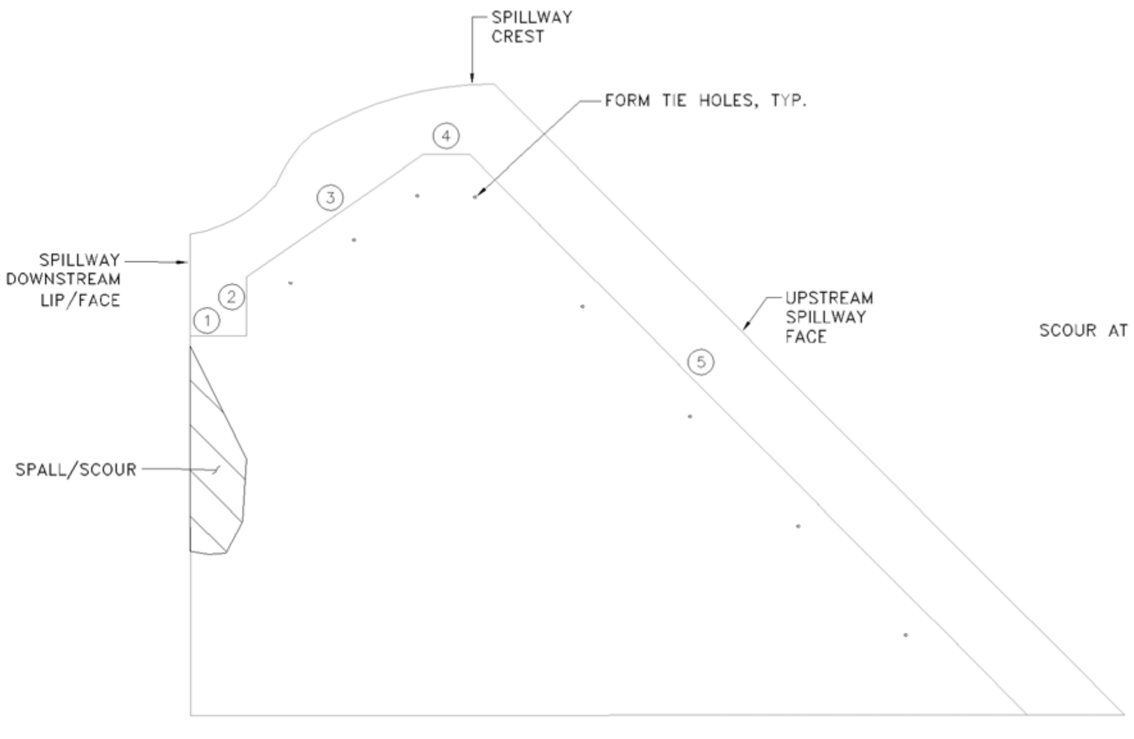
CHECKED BY:	
DRAWN BY:	HMS
APPROVED BY:	

CELL NO. 8

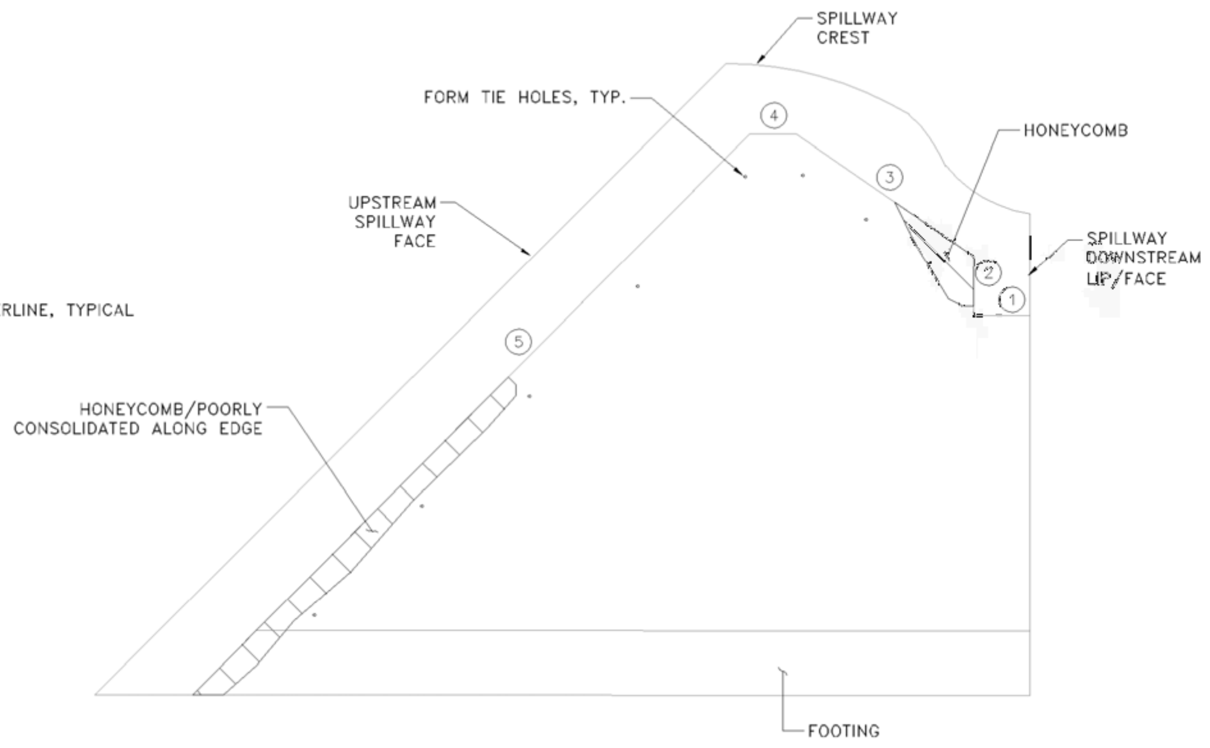
SHEET NO.:
8



RIGHT CELL WALL

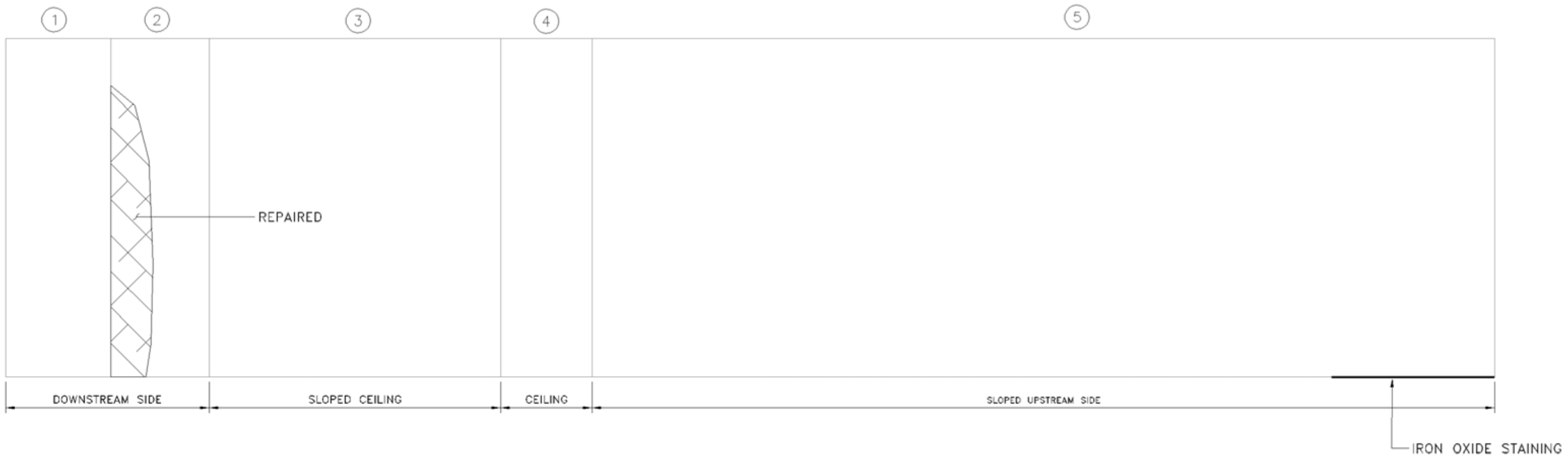
NOT TO SCALE

SCOUR AT WATERLINE, TYPICAL



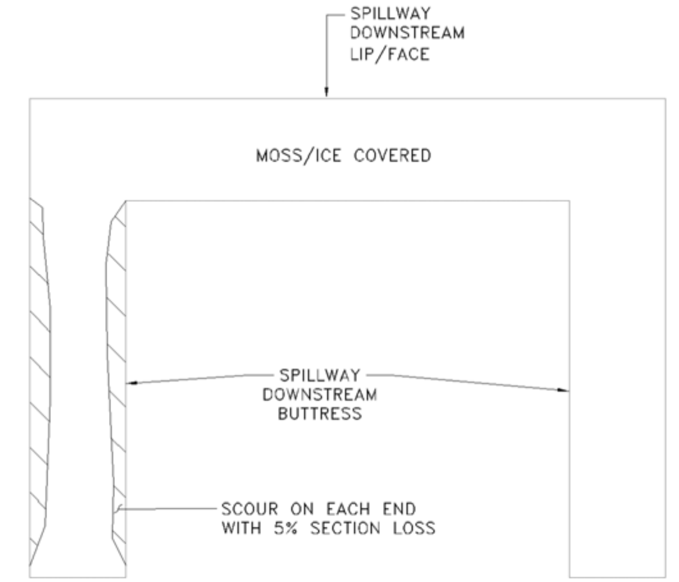
LEFT CELL WALL

NOT TO SCALE



UPSTREAM WALL AND CEILING OF CELL

NOT TO SCALE



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MILL POND DAM FEASIBILITY STUDY
DURHAM, NH
OWNER: TOWN OF DURHAM

REVISIONS:

PROJECT NO.:	19169.00
DATE:	DEC 2019
SCALE:	NTS
DESIGNED BY:	HMS
CHECKED BY:	
DRAWN BY:	HMS
APPROVED BY:	

CELL NO. 9

SHEET NO.:
9

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APPENDIX B
Photographs
Mill Pond Dam
Durham, NH

Photo No. 1: Dam from the right abutment looking left with flow over the spillway.

Photo No. 2: View of the upstream side of the crest from the top of the fish ladder looking right.

Photo No. 3: Scour on the left side of the right training wall upstream of the spillway crest.

Photo No. 4: View of the left end of the primary spillway and training wall.

Photo No. 5: Area of the previously reported leakage from the left training wall. Note vegetation within the joint and repair along the wall.

Photo No. 6: View of the downstream side of the dam with no flow over the spillway from under the bridge at Newmarket Road looking upstream.

Photo No. 7: Close-up view of the typical interior of a cell.

Photo No. 8: Scoured and severely deteriorated concrete with debonded rebar at the downstream side of the right training wall.

Cell 1

Photo No. 9: Left wall. Note section loss with spalling and scour on the downstream end.

Photo No. 10: Right side of the upstream sloped ceiling. Note the delamination of the repairs.

Photo No. 11: Right wall. Note spalling and delamination throughout the wall.

Photo No. 12: Repair on the downstream sloped ceiling section (ceiling face no.3). Note delamination above the repair and efflorescence.

Cell 2

Photo No. 13: Left Wall. Note the scour and spalling on the downstream end.

Photo No. 14: Right Wall. Note the section loss on the downstream end.

Photo No. 15: Delamination on the lower part of the upstream sloped ceiling (ceiling face no. 5).

Photo No. 16: Delamination on the upper part of the upstream sloped ceiling (ceiling face no. 5).

Cell 3

Photo No. 17: Left wall. Note scour and spalling on the downstream end and delamination on the upstream joint with the ceiling.

Photo No. 18: Right wall. Not scour and spalling on the downstream end.

Photo No. 19: Delaminated rebar on the rib between Cell 3 and Cell 4.

Photo No. 20: Overview of the upstream sloped ceiling.

Cell 4

Photo No. 21: Left wall. Note debonded rebar and spalling on the downstream end.

Photo No. 22: Large crack and spall along the right wall with iron oxide staining on the upstream end.

Photo No. 23: Spall with debonded rebar and 5-inch deep hole on the downstream end of the right wall.

Photo No. 24: Downstream sloped ceiling with repair and exposed rebar.

Photo No. 25: Left wall. Note scour and spalling on the downstream end approximately 1 foot above the waterline.

Photo No. 26: Right wall. Note debonded rebar and spalling on the downstream end.

Photo No. 27: Efflorescent staining and delamination on the right side of the upstream sloped ceiling

Photo No. 28: Downstream sloped ceiling (ceiling face no. 3).

Cell 6

Photo No. 29: Left Wall. Note efflorescent staining and cracks.

Photo No. 30: Delamination and staining along the joint between the ceiling and the left wall.

Photo No. 31: Repair on the right side of the downstream sloped ceiling,

Photo No. 32: Spalling with debonded rebar on the underside of the downstream most ceiling (ceiling face no. 1).

Cell 7

Photo No. 33: Left wall. Note efflorescent staining.

Photo No. 34: Right wall. Note crack and delamination extending along the upstream and upper side of the wall.

Photo No. 35: Delamination and crack with seepage below on the top of the right cell wall.

Photo No. 36: Delamination and efflorescence throughout the downstream sloped ceiling.

Cell 8

Photo No. 37: Left wall. Note repairs covered with timber falsework.

Photo No. 38: Right wall. Note repairs covered with timber falsework and spalling on the downstream end.

Photo No. 39: Exposed and deteriorated rebar on the upstream sloped ceiling.

Photo No. 40: Area of exposed and deteriorated rebar on the downstream sloped ceiling.

Cell 9

Photo No. 41: Upstream left corner of the cell with iron oxide staining.

Photo No. 42: Repair on the downstream side of the cell (ceiling face no.2).

Photo No. 43: Downstream sloped ceiling.

Photo No. 44: Overview of the cell.

Photo No. 45: Overview of the top of the low-level outlet structure.

Photo No. 46: Intake of the gate structure.

Photo No. 47: Right abutment upstream of the dam from the gate structure. Note snow cover.

Photo No. 48: Inside of the top of the gate opening. Note irregular concrete typical in both gate openings.

Photo No. 49: The gate structure and mill foundation from downstream of the dam looking upstream.

Photo No. 50: Left and right low-level outlets. Note the severe concrete deterioration and ice buildup throughout the downstream face of the structure.

Photo No. 51: Right side of the right training wall and concrete downstream of the left gate. Note cracking with efflorescent staining and ice on the concrete. Additionally, note the leakage through the left gate.

Photo No. 52: Remnants of the mill foundation downstream of the gate structure.

Photo No. 53: Overview of the fish ladder at the left end of the spillway..

Photo No. 54: Fish ladder inlet with stop logs in. Note leakage from the stop logs.

Photo No. 55: Inside of the fish ladder.

Photo No. 56: Scour and undermining underneath the right training wall of the fish ladder. Note void probed up to 3 feet.

Photo No. 57: Outlet of the fish ladder.

Photo No. 58: Downstream area of the dam from the top of the fish ladder.

Photo No. 59: Overview of Mill Oyster River downstream of Newmarket Road Bridge

Photo No. 60: Mill Pond Dam and the impoundment from the top of the bridge at Newmarket Road.

APPENDIX C
Previous Reports and References

Mill Pond Dam

Durham, NH

REFERENCES AND RESOURCES

The following reports were referenced during the preparation of this report:

1. “Mill Pond Dam – D071003, Hazard Classification Assessment”, New Hampshire Department of Environmental Services, dated September 10, 2018.

2. “Dam Evaluation Report – Oyster River Dam”, Stephens Associates Consulting Engineers, dated March 17, 2009.

3. “Letter to Andrea Bodo”, New Hampshire Division of Historical Resources”, dated February 4, 2009.

4. “Site Inspection Form”, New Hampshire Department of Environmental Services, dated September 18, 2007.

5. “Dam Inspection Report”, GZA GeoEnvironmental, Inc, dated October 3, 2000.

The following were referenced during the completion of the visual inspection and preparation of this report and the development of the recommendations presented herein:

1. “Design of Small Dams”, United States Department of the Interior Bureau of Reclamation, 1987.
2. “ER 110-2-106 - Recommended Guidelines for Safety Inspection of Dams”, Department of the Army, September 26, 1979.
3. “Guidelines for Reporting the Performance of Dams” National Performance of Dams Program, August 1994.

The following provides an abbreviated list of resources for dam owners to locate additional information pertaining to dam safety, regulations, maintenance, operations, and other information relevant to the ownership responsibilities associated with their dam.

1. NHDES Dam Bureau Website: https://www.des.nh.gov/organization/divisions/water/dam/index.htm
2. “Dam Owner’s Guide To Plant Impact On Earthen Dams” *FEMA L-263,September 2005*
3. “Technical Manual for Dam Owners: Impacts of Plants on Earthen Dams” *FEMA 534, September 2005*
4. “Dam Safety: An Owners Guidance Manual” *FEMA 145,December 1986*
5. Association of Dam Safety Officials – Website: www.asdso.org/
6. “Dam Ownership – Responsibility and Liability”, ASDSO

APPENDIX D

Common Dam Safety Definitions

Mill Pond Dam

Durham, NH

COMMON DAM SAFETY DEFINITIONS

For a comprehensive list of dam engineering terminology and definitions refer to State of New Hampshire Env-Wr 100-700 Dam Rules, or other reference published by FERC, Dept. of the Interior Bureau of Reclamation, or FEMA.

Orientation

Upstream – Shall mean the side of the dam that borders the impoundment.

Downstream – Shall mean the high side of the dam, the side opposite the upstream side.

Right – Shall mean the area to the right when looking in the downstream direction.

Left – Shall mean the area to the left when looking in the downstream direction.

Dam Components

Dam – Shall mean any artificial barrier, including appurtenant works, which impounds or diverts water.

Embankment – Shall mean the fill material, usually earth or rock, placed with sloping sides, such that it forms a permanent barrier that impounds water.

Crest – Shall mean the top of the dam, usually provides a road or path across the dam.

Abutment – Shall mean that part of a valley side against which a dam is constructed. An artificial abutment is sometimes constructed as a concrete gravity section, to take the thrust of an arch dam where there is no suitable natural abutment.

Appurtenant Works – Shall mean structures, either in dams or separate therefrom, including but not be limited to, spillways; reservoirs and their rims; low level outlet works; and water conduits including tunnels, pipelines, or penstocks, either through the dams or their abutments.

Spillway – Shall mean a structure over or through which water flows are discharged. If the flow is controlled by gates or boards, it is a controlled spillway; if the fixed elevation of the spillway crest controls the level of the impoundment, it is an uncontrolled spillway.

Hazard Classification

High Hazard – means a dam where failure or misoperation will result in probable loss of human life.

Significant Hazard – means a dam where failure or misoperation results in no probable loss of human life but can cause major economic loss to structures or property, structural damage to a class I or class II road which could render the road impassable or otherwise interrupt public safety services, or major environmental or public health losses.

Low Hazard – means a dam where failure or misoperation results in no probable loss of human life, low economic losses, structural damage to a town or city road or private road accessing property other than the dam owner's which could render the road impassable or otherwise interrupt public safety services, the release of liquid industrial, agricultural, or commercial wastes, septage, or contaminated sediment if the storage capacity is less than 2 acre-feet and is located more than 250 feet from a water body or water course, Reversible environmental losses to environmentally-sensitive sites.

General

EAP – Emergency Action Plan – Shall mean a predetermined (and properly documented) plan of action to be taken to reduce the potential for property damage and/or loss of life in an area affected by an impending dam failure.

O&M Manual – Operations and Maintenance Manual; Document identifying routine maintenance and operational procedures under normal and storm conditions.

Normal Pool – Shall mean the elevation of the impoundment during normal operating conditions.

Acre-foot – Shall mean a unit of volumetric measure that would cover one acre to a depth of one foot. It is equal to 43,560 cubic feet. One million U.S. gallons = 3.068 acre feet.

Height of Dam– means the vertical distance from the lowest point of natural ground on the downstream side of the dam to the highest part of the dam which would impound water.

Hydraulic Height – means the height to which water rises behind a dam and the difference between the lowest point in the original streambed at the axis of the dam and the maximum controllable water surface.

Maximum Water Storage Elevation – means the maximum elevation of water surface which can be contained by the dam without overtopping the embankment section.

Spillway Design Flood (SDF) – Shall mean the flood used in the design of a dam and its appurtenant works particularly for sizing the spillway and outlet works, and for determining maximum temporary storage and height of dam requirements.

Maximum Storage Capacity – The volume of water contained in the impoundment at maximum water storage elevation.

Normal Storage Capacity – The volume of water contained in the impoundment at normal water storage elevation.

Condition Rating

Unsafe – Means the condition of a regulated dam, as determined by the Director, is such that an unreasonable risk of failure exists that will result in a probable loss of human life or major economic loss. Among the conditions that would result in this determination are: excessive vegetation that does not allow the Director to perform a complete visual inspection of a dam, excessive seepage or piping, significant erosion problems, inadequate spillway capacity, inadequate capacity and/or condition of control structure(s) or serious structural deficiencies, including movement of the structure or major cracking.

Poor – A component that has deteriorated beyond a maintenance issue and requires repair.; the component no longer functions as it was originally intended.

Fair – Means a component that requires maintenance

Good – Meeting minimum guidelines where no irregularities are observed, and the component appears to be maintained properly.

APPENDIX E
Visual Dam Inspection Limitations
Mill Pond Dam
Durham, NH

VISUAL DAM INSPECTION
LIMITATIONS

Visual Inspection

1. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations and analyses involving topographic mapping, subsurface investigations, testing and detailed computational evaluations are beyond the scope of this report.

2. In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection, along with data available to the inspection team.

3. In cases where an impoundment is lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions, which might otherwise be detectable if inspected under the normal operating environment of the structure.

4. It is critical to note that the condition of the dam is evolutionary in nature and depends on numerous and constantly changing internal and external conditions. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Use of Report

5. The applicability of environmental permits needs to be determined prior to undertaking maintenance activities that may occur within resource areas under the jurisdiction of any regulatory agency.

6. This report has been prepared for the exclusive use of the Town of Durham for specific application to the referenced dam site in accordance with generally accepted engineering practices. No other warranty, expressed or implied, is made.

7. This report has been prepared for this project by Pare. This report is for preliminary evaluation purposes only and is not necessarily sufficient to support design of repairs or recommendations or to prepare an accurate bid.

Appendix C:
Cost Estimates

Table 2.9-1 - Preliminary Opinion of Construction Phase Costs, by Alternative

	Alt 2: Repair	Alt 3: Stabilization	Alt 4: Redesign	Alt 5: Removal
Construction Components				
General Construction Items	$ 112,000.00	$ 77,000.00	$ 136,000.00	$ 98,000.00
Spillway Stabilization	$ 217,000.00	$ 327,000.00	N/A	N/A
Repair Scour and Undermining	$ 3,000.00	$ 3,000.00	N/A	N/A
Gated Outlet Structure	$ 115,000.00	$ 78,000.00	$ 124,000.00	N/A
Spillway replacement	N/A	N/A	$ 168,000.00	N/A
Raise Left abutment	N/A	N/A	$ 4,000.00	N/A
Construct Auxiliary spillway	N/A	N/A	$ 111,000.00	N/A
Construct Dike	N/A	N/A	$ 8,000.00	N/A
Demolition of Dam	N/A	N/A	N/A	$ 197,000.00
Environmental Components[1]				
Pond Restoration Dredge (Option 1)	$ 3,150,000.00	$ 3,150,000.00	$ 3,150,000.00	N/A
Active Channel Restoration (Option 2)	N/A	N/A	N/A	$ 711,000.00
General Items				
Bonds & Contingency	$ 118,000.00	$ 128,000.00	$ 145,000.00	$ 78,000.00
Engineering, Design, & Permitting	$ 190,000.00	$ 180,000.00	$ 300,000.00	$ 150,000.00
Construction Phase Services	$ 120,000.00	$ 120,000.00	$ 150,000.00	$ 80,000.00
Total Construction Phase Cost	**$ 4,025,000.00**	**$ 4,063,000.00**	**$ 4,296,000.00**	**$ 1,314,000.00**

1. Includes Engineering, Design, Permitting, and Construction Engineering Costs specific to environmental elements

Oyster River Dam at Mill Pond

Durham, NH

Table 2.9-2a - Life Cycle Cost Analysis (30 Year Analysis w/o Environmental Components)

	Alt 2: Repair	Alt 3: Stabilization	Alt 4: Redesign	Alt 5: Removal
Initial Capital Investment				
Discount Factor	1	1	1	1
Initial Capital Cost	$875,000	$913,000	$1,146,000	$603,000
Capital Replacement Cost				
Assumed Design Life (yrs)	30	50	>50	N/A
Assumed CIP Cost Percentage	100%	60%	40%	0%
Discount Factor	0.412	0.412	0.412	0.412
Operations & Maintenance				
O&M Costs	$2,400	$2,400	$2,400	$1,000
Discount Factor	19.6	19.6	19.6	19.6
Total Present Cost	**$ 1,282,540**	**$ 1,185,734**	**$ 1,381,901**	**$ 622,600**

Table 2.9-2b - Life Cycle Cost Analysis (30 Year Analysis WITH Environmental Components)

	Alt 2: Repair with Pond Dredge	Alt 3: Stabilization with Pond Dredge	Alt 4: Redesign with Pond Dredge	Alt 5: Removal & Channel Restoration
Initial Capital Investment				
Discount Factor	1	1	1	1
Initial Capital Cost	$4,025,000	$4,063,000	$4,296,000	$1,314,000
Capital Replacement Cost				
Assumed Design Life (yrs)	30	50	>50	N/A
Assumed CIP Cost Percentage	100%	60%	40%	0%
Discount Factor	0.412	0.412	0.412	0.412
Operations & Maintenance				
O&M Costs	$2,400	$2,400	$2,400	$1,000
Discount Factor	19.6	19.6	19.6	19.6
Total Present Cost	**$ 5,730,340**	**$ 5,114,414**	**$ 5,051,021**	**$ 1,333,600**

Notes:

1. Discount factors taken from 2019 supplement to NIST LCC Tables A-1 and A-2
2. Alt 5: Does not include sediment management and/or stream restoration costs
3. Alt 5: No infrastructure remains; no capital replacement cost required

PARE CORPORATION

PROJECT : Oyster River Dam at Mill Pond - Durham, NH PROJECT NUMBER: 19169.00
SUBJECT: Conceptual Opinion of Probable Cost - Repair
COMPUTATIONS BY: HMS DATE: OCT 2020
CHECK BY: ARO DATE: OCT 2020

CONCEPTUAL OPINION OF PROBABLE COST - Alt. 2 Repairs

Item	Quantity	Unit	Unit Price	Total	Source
General Bid Items					
Project Superintendent	2	MON	$ 8,200.00	$ 16,400.00	Engineers Judgment
QC Plans	1	LS	$ 3,000.00	$ 3,000.00	Engineers Judgment
Submittals	1	EA	$ 3,000.00	$ 3,000.00	Engineers Judgment
Schedules	1	EA	$ 150.00	$ 150.00	Engineers Judgment
Meetings	4	EA	$ 150.00	$ 600.00	Engineers Judgment
Portable Toilets	2	MON	$ 150.00	$ 300.00	Engineers Judgment
Concrete Sampling/Testing	8	EA	$ 400.00	$ 3,200.00	Engineers Judgment
Concrete Compression Tests	8	EA	$ 30.00	$ 240.00	Engineers Judgment
Subtotal				**$ 26,890.00**	
Mobilization & Demolition					
Mobilization	1	LS	$ 17,500.00	$ 18,000.00	Engineers Judgment
Demobilization	1	LS	$ 12,000.00	$ 12,000.00	Engineers Judgment
Subtotal				**$ 30,000.00**	
Erosion & Sediment Control					
Turbidity Barriers	200	LF	$ 30.00	$ 6,000.00	NH645.0001
Maintenance	1	LS	$ 1,500.00	$ 1,500.00	Engineer's Judgement
Subtotal				**$ 7,500.00**	
Control of Water					
Engineering Design	1	LS	$ 10,000.00	$ 10,000.00	Recent Project Costs
Cofferdam / Diversions	1	LS	$ 35,000.00	$ 35,000.00	Recent Project Costs
Dewatering	1	LS	$ 2,500.00	$ 2,500.00	
Subtotal				**$ 47,500.00**	
Stabilize spillway ribs					
Form/Place Concrete	105	CY	$ 1,400.00	$ 147,000.00	Recent Project Costs/Engineer's Judgement
Subtotal				**$ 147,000.00**	
Repair Gated Outlet					
Remove & Dispose Existing Gates	1	LS	$ 2,000.00	$ 2,000.00	Recent Project Costs
New Slide Gate	1	LS	$ 10,000.00	$ 10,000.00	Recent Project Costs
Install Slide Gate	2	DAY	$ 2,500.00	$ 5,000.00	Recent Project Costs
Stabilize Upstream Side with Concrete	25	CY	$ 1,400.00	$ 35,000.00	Recent Project Costs
Stabilize Downstream Side with Concrete	45	CY	$ 1,400.00	$ 63,000.00	Recent Project Costs
Subtotal				**$ 115,000.00**	
Concrete Sealer					
Seal Concrete	3500	SF	$ 20.00	$ 70,000.00	NH536.11
Subtotal				**$ 70,000.00**	
Scour Repair					
Fill Scour at Fish ladder	7	CF	$ 250.00	$ 1,750.00	Recent Project Costs
Fill Scour at Right Training Wall	5	CF	$ 250.00	$ 1,250.00	Recent Project Costs
Subtotal				**$ 3,000.00**	
			SUBTOTAL	**$ 447,000.00**	(Rounded to the nearest $1,000)
			Contract Bonds	$ 5,000.00	1% of Project Subtotal
			Contingency	$ 113,000.00	25%
OPINION OF TOTAL CONSTRUCTION COST (Base Work)				**$ 565,000.00**	
Engineering, Design, and Permitting				$ 190,000.00	
Construction Phase Services Budget				$ 120,000.00	
OPINION OF TOTAL PROJECT COST (Base Work)				**$ 875,000.00**	

PARE
CORPORATION

PROJECT : Oyster River Dam at Mill Pond - Durham, NH | PROJECT NUMBER: 19169.00
SUBJECT: Conceptual Opinion of Probable Cost - Spillway Stabilization
COMPUTATIONS BY: HMS | DATE: OCT 2020
CHECK BY: ARO | DATE: OCT 2020

CONCEPTUAL OPINION OF PROBABLE COST - Alt. 3: Stabilization

Item	Quantity	Unit	Unit Price	Total	Source
General Bid Items					
Project Superintendent	2	MON	$ 8,200.00	$ 16,400.00	Engineers Judgment
QC Plans	1	LS	$ 1,000.00	$ 1,000.00	Engineers Judgment
Submittals	5	EA	$ 175.00	$ 875.00	Engineers Judgment
Schedules	1	EA	$ 150.00	$ 150.00	Engineers Judgment
Meetings	4	EA	$ 150.00	$ 600.00	Engineers Judgment
Portable Toilets	2	MON	$ 150.00	$ 300.00	Engineers Judgment
Concrete Sampling/Testing	8	EA	$ 400.00	$ 3,200.00	Engineers Judgment
Concrete Compression Tests	8	EA	$ 30.00	$ 240.00	Engineers Judgment
Subtotal				**$ 22,765.00**	
Mobilization & Demolition					
Mobilization	1	LS	$ 10,000.00	$ 15,000.00	Engineers Judgment
Demobilization	1	LS	$ 5,000.00	$ 10,000.00	Engineers Judgment
Subtotal				**$ 25,000.00**	
Erosion & Sediment Control					
Turbidity Barriers	105	LF	$ 30.00	$ 3,150.00	NH645.0001
Maintenance	1	LS	$ 1,000.00	$ 1,000.00	Engineer's Judgement
Subtotal				**$ 4,150.00**	
Control of Water					
Engineering Design	1	LS	$ 5,000.00	$ 5,000.00	Recent Project Costs
Cofferdam / Control of Water	1	LS	$ 20,000.00	$ 20,000.00	Recent Project Costs
Subtotal				**$ 25,000.00**	
Spillway Stabilization					
Form/Place Concrete Within Spillway Cells	275	CY	$ 1,100.00	$ 302,785.19	Recent Project Costs/Engineer's Judgement
Fiber Mesh	275	CY	$ 100.00	$ 27,525.93	Recent Project Costs/Engineer's Judgement
Subtotal				**$ 330,311.11**	
Repair Gated Outlet					
Stabilize Upstream Side with Concrete	36	CY	$ 1,100.00	$ 39,111.11	Recent Project Costs
Stabilize Downstream Side with Concrete	36	CY	$ 1,100.00	$ 39,111.11	Recent Project Costs
Subtotal				**$ 78,222.22**	
			SUBTOTAL	**$ 486,000.00**	(Rounded to the nearest $1,000)
			Contract Bonds	$ 5,000.00	1% of Project Subtotal
			Contingency	$ 123,000.00	25%
			OPINION OF TOTAL CONSTRUCTION COST (Base Work)	**$ 614,000.00**	
			Engineering, Design, & Permitting	$ 180,000.00	
			Construction Phase Services Budget	$ 120,000.00	
			OPINION OF TOTAL PROJECT COST (Base Work)	**$ 914,000.00**	

PROJECT : Oyster River Dam at Mill Pond - Durham, PROJECT NUMBER: 19169.00
SUBJECT: Conceptual Opinion of Probable Cost - Redesign
COMPUTATIONS BY: HMS DATE: OCT 2020
CHECK BY: ARO DATE: OCT 2020

CONCEPTUAL OPINION OF PROBABLE COST - Alt. 4: Redesign

Item	Quantity	Unit	Unit Price	Total	Source
General Bid Items					
Project Superintendent	4	MON	$ 8,200.00	$ 32,800.00	Engineers Judgment
QC Plans	1	LS	$ 1,000.00	$ 1,000.00	Engineers Judgment
Submittals	15	EA	$ 175.00	$ 2,625.00	Engineers Judgment
Schedules	8	EA	$ 150.00	$ 1,200.00	Engineers Judgment
Meetings	16	EA	$ 150.00	$ 2,400.00	Engineers Judgment
Portable Toilets	4	MON	$ 150.00	$ 600.00	Engineers Judgment
Concrete Sampling/Testing	12	EA	$ 400.00	$ 4,800.00	Engineers Judgment
Concrete Compression Tests	12	EA	$ 30.00	$ 360.00	Engineers Judgment
Subtotal				**$ 45,785.00**	
Mobilization & Demolition					
Mobilization	1	LS	$ 15,000.00	$ 25,000.00	Engineers Judgment
Demobilization	1	LS	$ 10,000.00	$ 15,000.00	Engineers Judgment
Subtotal				**$ 40,000.00**	
Erosion & Sediment Control					
Straw bales	100	LF	$ 7.00	$ 700.00	Recent Project Costs
Silt Fence	100	LF	$ 5.00	$ 500.00	Recent Project Costs
Maintenance	1	LS	$ 1,500.00	$ 1,500.00	Engineer's Judgment
Subtotal				**$ 2,700.00**	
Control of Water					
Engineering Design	1	LS	$ 10,000.00	$ 10,000.00	Recent Project Costs
Cofferdam / Diversions	1	LS	$ 35,000.00	$ 35,000.00	Recent Project Costs
Dewatering	1	LS	$ 2,500.00	$ 2,500.00	
Subtotal				**$ 47,500.00**	
Gated Outlet Headwall Demolition					
Remove & Dispose Existing Gates	1	LS	$ 2,000.00	$ 2,000.00	Recent Project Costs
Remove Existing Material	125	CY	$ 40.00	$ 5,000.00	Recent Project Costs
Disposal	240	TON	$ 15.00	$ 3,600.00	
Subtotal				**$ 10,600.00**	
Reconstruct Gated Outlet					
New Slide Gate	1	LS	$ 10,000.00	$ 10,000.00	Recent Project Costs
Install Slide Gate	2	DAY	$ 2,500.00	$ 5,000.00	Recent Project Costs
Gatehouse Concrete Structure	70	CY	$ 1,400.00	$ 98,000.00	
Subtotal				**$ 113,000.00**	
Fill Left Abutment					
Import Engineered Fill	60	TON	$ 25.00	$ 1,500.00	Recent Project Costs
Engineered Fil Placement	30	CY	$ 30.00	$ 900.00	Recent Project Costs
Import Loam	10	TON	$ 25.00	$ 250.00	Recent Project Costs
Loam and Seed	20	CY	$ 9.00	$ 180.00	Recent Project Costs
concrete cap	1	CY	$ 1,400.00	$ 1,400.00	Recent Project Costs
Subtotal				**$ 4,230.00**	
Primary Spillway Wall					
R&D Existing	120	CY	$ 350.00	$ 42,000.00	Recent Project Costs
New Spillway	90	CY	$ 1,400.00	$ 126,000.00	Recent Project Costs
Subtotal				**$ 168,000.00**	
Auxiliary Spillway Wall					
Spillway Wall	50	CY	$ 1,400.00	$ 70,000.00	Recent Project Costs
Engineered Fil Placement	60	CY	$ 30.00	$ 1,800.00	Recent Project Costs
Training Wall	25	CY	$ 1,400.00	$ 35,000.00	Recent Project Costs
Import Engineered Fill	120	TON	$ 35.00	$ 4,200.00	Recent Project Costs
Subtotal				**$ 111,000.00**	
Construct Dike					
Import Engineered Fill	100	TON	$ 25.00	$ 2,500.00	Recent Project Costs
Engineered Fil Placement	50	CY	$ 30.00	$ 1,500.00	Recent Project Costs
Import Loam	30	TON	$ 25.00	$ 750.00	Recent Project Costs
Loam and Seed	15	CY	$ 9.00	$ 135.00	Recent Project Costs
Import Bedding Stone	30	TON	$ 35.00	$ 1,050.00	Recent Project Costs
Import Riprap	30	TON	$ 35.00	$ 1,050.00	Recent Project Costs
Riprap Slope Protection	15	SY	$ 75.00	$ 1,125.00	Recent Project Costs
Subtotal				**$ 8,110.00**	
SUBTOTAL				**$ 551,000.00**	(Rounded to the nearest $1,000)
Contract Bonds				$ 6,000.00	1% of Project Subtotal
Contingency				$ 139,000.00	25%
OPINION OF TOTAL CONSTRUCTION COST (Base Work)				**$ 696,000.00**	
Engineering, Design, & Permitting				$ 300,000.00	
Construction Phase Services Budget				$ 150,000.00	
OPINION OF TOTAL PROJECT COST (Base Work)				**$ 1,146,000.00**	

PARE CORPORATION

PROJECT : Oyster River Dam at Mill Pond - Durham, NH PROJECT NUMBER: 19169.00
SUBJECT: Conceptual Opinion of Probable Cost - Removal & Channel Restoration
COMPUTATIONS BY: HMS DATE: OCT 2020
CHECK BY: ARO DATE: OCT 2020

CONCEPTUAL OPINION OF PROBABLE COST - Alt. 5: Removal & Channel Restoration

Item	Quantity	Unit	Unit Price	Total	Source
General Bid Items					
Project Superintendent	3	MON	$ 8,200.00	$ 24,600.00	Engineers Judgment
QC Plans	1	LS	$ 5,000.00	$ 5,000.00	Engineers Judgment
Submittals	16	EA	$ 150.00	$ 2,400.00	Engineers Judgment
Schedules	8	EA	$ 150.00	$ 1,200.00	Engineers Judgment
Meetings	12	EA	$ 150.00	$ 1,800.00	Engineers Judgment
Portable Toilets	3	MON	$ 150.00	$ 450.00	Engineers Judgment
Sieve Analyses	2	TEST	$ 100.00	$ 200.00	Laboratory Quote plus markup
Chemical Soil Tests	2	TEST	$ 1,000.00	$ 2,000.00	Recent project bids
Subtotal				**$ 37,650.00**	
Mobilization & Demolition					
Mobilization	1	LS	$ 15,000.00	$ 15,000.00	Engineers Judgment
Demobilization	1	LS	$ 5,000.00	$ 5,000.00	Engineers Judgment
Subtotal				**$ 20,000.00**	
Erosion & Sediment Control					
Straw bales	100	LF	$ 7.00	$ 700.00	Recent Project Costs
Silt Fence	100	LF	$ 5.00	$ 500.00	Recent Project Costs
Maintenance	1	LS	$ 1,500.00	$ 1,500.00	Engineer's Judgment
Subtotal				**$ 2,700.00**	
Control of Water					
Engineering Design	1	LS	$ 7,500.00	$ 7,500.00	Recent Project Costs
Diversions	1	LS	$ 25,000.00	$ 25,000.00	Recent Project Costs
Dewatering	1	LS	$ 5,000.00	$ 5,000.00	
Subtotal				**$ 37,500.00**	
Demolition (Dam)					
Fish Ladder	60	CY	$ 300.00	$ 18,000.00	Recent Project Costs
Spillway Section	120	CY	$ 300.00	$ 36,000.00	Recent Project Costs
Subtotal				**$ 54,000.00**	
Dam Site Channel Restoration					
Sediment Excavation	250	CY	$ 14.00	$ 3,500.00	NHDOT 203.4
Handle Sediment	250	CY	$ 40.00	$ 10,000.00	NHDOT 203.35
Streambed Fill Placement	1020	CY	$ 75.00	$ 76,500.00	
Channel Creation Dam Site	15	DAY	$ 3,500.00	$ 52,500.00	
Subtotal				**$ 142,500.00**	
SUBTOTAL				**$ 295,000.00**	(Rounded to the nearest $1,000)
Contract Bonds				$ 3,000.00	1% of Project Subtotal
Contingency				$ 75,000.00	25%
OPINION OF TOTAL CONSTRUCTION COST (Base Work)				**$ 373,000.00**	
Engineering, Design & Permitting				$ 150,000.00	
Construction Phase Services Budget				$ 80,000.00	
OPINION OF TOTAL PROJECT COST (Base Work)				**$ 603,000.00**	

PARE CORPORATION

PROJECT : Oyster River Dam at Mill Pond - Durham, NH PROJECT NUMBER: 19169.00
SUBJECT: Conceptual Opinion of Probable Cost - Removal & Channel Restoration
COMPUTATIONS BY: HMS DATE: OCT 2020
CHECK BY: ARO DATE: OCT 2020

CONCEPTUAL OPINION OF PROBABLE COST - Alt. 5: Channel Restoration in Pond (ADD)

Item	Quantity	Unit	Unit Price	Total	Source
General Bid Items					
Project Superintendent	2	MON	$ 8,200.00	$ 16,400.00	Engineers Judgment
QC Plans	1	LS	$ 5,000.00	$ 5,000.00	Engineers Judgment
Submittals	6	EA	$ 150.00	$ 900.00	Engineers Judgment
Schedules	2	EA	$ 150.00	$ 300.00	Engineers Judgment
Meetings	8	EA	$ 150.00	$ 1,200.00	Engineers Judgment
Portable Toilets	2	MON	$ 150.00	$ 300.00	Engineers Judgment
Sieve Analyses	2	TEST	$ 100.00	$ 200.00	Laboratory Quote plus markup
Chemical Soil Tests	2	TEST	$ 1,000.00	$ 2,000.00	Recent project bids
Subtotal				**$ 26,300.00**	
Mobilization & Demolition					
Mobilization	1	LS	$ 15,000.00	$ 15,000.00	Engineers Judgment
Demobilization	1	LS	$ 5,000.00	$ 5,000.00	Engineers Judgment
Subtotal				**$ 20,000.00**	
Erosion & Sediment Control					
Straw bales	400	LF	$ 7.00	$ 2,800.00	Recent Project Costs
Silt Fence	1300	LF	$ 5.00	$ 6,500.00	Recent Project Costs
Maintenance	1	LS	$ 1,500.00	$ 1,500.00	Engineer's Judgment
Subtotal				**$ 10,800.00**	
Control of Water					
Engineering Design	1	LS	$ 3,000.00	$ 3,000.00	Recent Project Costs; Add to site work
Diversions	1	LS	$ 60,000.00	$ 60,000.00	Recent Project Costs; Add to site work
Dewatering	1	LS	$ 2,500.00	$ 2,500.00	Recent Project Costs; Add to site work
Subtotal				**$ 65,500.00**	
Sediment Management					
Temporary Access Ramps / Roads	1	LS	$ 35,000.00	$ 35,000.00	Engineers Judgment
Sediment Excavation	3000	CY	$ 14.00	$ 42,000.00	NHDOT 203.4
Handle Sediment	3000	CY	$ 40.00	$ 120,000.00	NHDOT 203.35
Dispose Sediment	4860	TN	$ 50.00	$ 243,000.00	NHDOT 181.11 (assume unregulated)
Subtotal				**$ 440,000.00**	

SUBTOTAL	**$ 563,000.00**	(Rounded to the nearest $1,000)
Contract Bonds	$ 6,000.00	1% of Project Subtotal
Contingency	$ 142,000.00	25%
OPINION OF TOTAL CONSTRUCTION COST (Base Work)	**$ 711,000.00**	
Engineering, Design & Permitting	$ 80,000.00	
Construction Phase Services Budget	$ 60,000.00	
OPINION OF TOTAL CONSTRUCTION PHASE COST (Base Work)	**$ 851,000.00**	

[redacted]

Construction Cost Estimate [1, 2, 3]

2 Bedford Farms Drive
Suite 200
Bedford, NH 03110
603.391.3900

Date: 6/8/2020
Job Number: 52633
Percent Complete: Preliminary

Project: Oyster River Dam at Mill Pond
Location: Durham, NH
Estimator: DWC
Checked By: LC

Option Summary

Option Type	Option Name	Total Cost
Access	Mill Pond Road	$47,929
Access	Newmarket Road	$106,393
Dredging	Mechanical Dredging - Area 1	$273,537
Dredging	Hydraulic Dredging - Area 1	$321,727
Dredging	Mechanical Dredging - Area 2	$447,870
Dredging	Hydraulic Dredging - Area 2	$393,664
Dredging	Mechanical Dredging - Area 3	$312,268
Dredging	Hydraulic Dredging - Area 3	$298,197
Off-Site Disposal	Area 1	$246,708
Off-Site Disposal	Area 2	$433,800
Off-Site Disposal	Area 3	$264,600
Engineering Services	All Options	$65,500

Oyster River Dam at Mill Pond

Pond Restoration through Dredging

Preliminary Cost Estimate - DRAFT for REVIEW

Area	Dredge Area (sf)	Dredge Volume (CY)	Access Option[3]	Dredging Option	Total Construction Cost	Mobilization and Site Access	Engineering Services[4]	25% Contingency	Project Total Cost
Area 1	23,500	3,560	Mill Pond Road	Mechanical	$568,174	45,454	$65,500	$153,407	$840,000
Area 1	23,500	3,560	Newmarket Road	Hydraulic	$674,828	53,986	$65,500	$182,203	$980,000
Area 2	46,300	4,820	Mill Pond Road	Mechanical	$929,599	74,368	$65,500	$250,992	$1,330,000
Area 2	46,300	4,820	Newmarket Road	Hydraulic	$933,857	74,709	$65,500	$252,141	$1,330,000
Area 3	34,000	2,940	Newmarket Road	Mechanical	$683,261	54,661	$65,500	$184,481	$990,000
Area 3	34,000	2,940	Newmarket Road	Hydraulic	$669,190	53,535	$65,500	$180,681	$970,000
Total[5]	103,800	11,320	(Both)	Mechanical	**$2,141,034**	**171,283**	**$65,500**	**$578,079**	**$2,960,000**
Total	103,800	11,320	Newmarket Road	Hydraulic	**$2,277,875**	**182,230**	**$65,500**	**$615,026**	**$3,150,000**

[1] VHB used DOT items where applicable

[2] VHB generated unit prices for construction items through a combination of NHDOT's Weighted Bid Prices, online resources, external consultation, RSMeans, and previous DOT and other in-water project experience. VHB conservatively estimated quantities for items using aerial takeoffs in AutoCAD,

[3] Hydraulic dredging is only feasibile from the Newmarket Road access option; there is insufficient space for operations at the Mill Pond Road access option

[4] Includes design, permitting, bathymetric survey, sediment sampling, natural resources delineation, etc.

[5] Total cost for all areas assumes 200 LF reduction in cofferdam length to mechanical dredge Areas 1 and 2 concurrently. Hydraulic dredge turbidity curtain remains unchanged to contain individual dredge cells.

2 Bedford Farms Drive
Suite 200
Bedford, NH 03110
603.391.3900

Date: 6/8/2020
Job Number: 52633
Percent Complete: Preliminary

Project: Oyster River Dam at Mill Pond
Location: Durham, NH
Estimator: DWC
Checked By: LC

Access Options

Mill Pond Road via Mill Pond Road Park for Areas 1 and 2

Item No.	Qty.	Unit	Description	Unit Cost	Amount
102.3	16	HR	CONTROL OF INVASIVE PLANTS EXISTING ON SITE	$ 450.00	$ 7,200.00
102.33	8	HR	INVASIVE PLANT MANAGEMENT STRATEGY	$ 280.00	$ 2,240.00
102.511	4	EA	TREE PROTECTION - ARMORING AND PRUNING	$ 450.00	$ 1,800.00
102.52	100	FT	TEMPORARY TREE PROTECTION FENCING	$ 15.00	$ 1,500.00
443.	0.7	MGL	WATER FOR ROADWAY DUST CONTROL	$ 55.00	$ 38.50
657.	400	FT	TEMPORARY FENCE	$ 20.00	$ 8,000.00
697.1	4	EA	SILT SACK	$ 175.00	$ 700.00
-	900	SY	RUBBER/IMPERMEABLE LINER	$ 15.00	$ 13,500.00
765.	900	SY	SEEDING	$ 2.50	$ 2,250.00
767.12	400	FT	COMPOST FILTER TUBES	$ 8.00	$ 3,200.00
-	1	LS	TRAFFIC MANAGEMENT	$ 7,500.00	$ 7,500.00
				Option Subtotal	$ 47,928.50

Newmarket Road via Map 6 Lot 9-6-1 for Area 3 and for all hydraulic dredging options

Item No.	Qty.	Unit	Description	Unit Cost	Amount
101.	0.1	A	CLEARING AND GRUBBING	$ 20,000.00	$ 2,000.00
102.3	16	HR	CONTROL OF INVASIVE PLANTS EXISTING ON SITE	$ 450.00	$ 7,200.00
102.33	8	HR	INVASIVE PLANT MANAGEMENT STRATEGY	$ 280.00	$ 2,240.00
102.52	80	FT	TEMPORARY TREE PROTECTION FENCING	$ 15.00	$ 1,200.00
443.	70	MGL	WATER FOR ROADWAY DUST CONTROL	$ 55.00	$ 3,850.00
304.4	593	CY	CRUSHED STONE FOR TEMPORARY ACCESS ROAD	$ 30.00	$ 17,790.00
595.5	1778	SY	GEOGRID FOR TEMPORARY ACCESS ROAD	$ 6.00	$ 10,668.00
-	900	SY	RUBBER/IMPERMEABLE LINER	$ 15.00	$ 13,500.00
765.	1778	SY	SEEDING	$ 2.50	$ 4,445.00
767.12	2000	FT	COMPOST FILTER TUBES	$ 8.00	$ 16,000.00
-	1	LS	TRAFFIC MANAGEMENT	$ 7,500.00	$ 7,500.00
-	1	LS	SHORELINE TREE RESTORATION	$ 20,000.00	$ 20,000.00
				Option Subtotal	$ 106,393.00

Dredging Options

Mechanical Dredging - Area 1

Item No.	Qty.	Unit	Description	Unit Cost	Amount
203.4	3560	CY	MUCK EXCAVATION	$ 11.00	$ 39,160.00
203.35	3560	CY	HANDLING EXCAVATED CONTAMINATED SOILS	$ 34.00	$ 121,040.00
-	653	SY	TEMPORARY SWAMP MATS	$ 25.00	$ 16,325.00
-	380	LF	6 FT SUPERSACK COFFERDAM WITH POLY SHEETING	$ 200.00	$ 76,000.00
-	49	CF	SUMP HOLE CONSTRUCTON, INCL. EXCAVATION GRAVEL, F	$ 2.21	$ 108.29
-	8	DAY	PUMP INSTALLATION AND RETRIEVAL PER PUMP PER DAY	$ 243.00	$ 1,944.00
-	240	DAY	ADDITIONAL PUMPING PER PUMP PER DAY	$ 79.00	$ 18,960.00
				Option Subtotal	$ 273,537.29

Hydraulic Dredging - Area 1

Item No.	Qty.	Unit	Description	Unit Cost	Amount
203.383	3560	CY	LIVE LOADING CONTAMINATED SOILS	$ 10.00	$ 35,600.00
-	800	LF	15' TURBIDITY CURTAIN	$ 40.00	$ 32,000.00
-	1	LS	ADDITIONAL BOATS	$ 10,000.00	$ 10,000.00
-	6052	LF	GEOTUBES (5 FT DIA)	$ 6.00	$ 36,312.00
-	1	LS	PUMPING SYSTEM	$ 50,000.00	$ 50,000.00
-	1	LS	ADDITIONAL DEWATERING BAG MATERIALS	$ 30,000.00	$ 30,000.00
-	4035	SY	REINFORCED POLYETHYLETE LINER	$ 11.25	$ 45,393.75
-	4035	SY	FILTRATION FABRIC	$ 15.00	$ 60,525.00
-	762	FT	SEDIMENT CONTROL BARRIER	$ 8.00	$ 6,096.00
-	100	LB	DISPOSAL OF GRANULAR ACTIVATED CARBON	$ 8.00	$ 800.00
-	30	DAY	EQUIPMENT RENTAL CONTINGENCY	$ 500.00	$ 15,000.00
				Option Subtotal	$ 321,726.75

[redacted]

Construction Cost Estimate $^{1, 2, 3}$

2 Bedford Farms Drive
Suite 200
Bedford, NH 03110
603.391.3900

Date: 6/8/2020
Job Number: 52633
Percent Complete: Preliminary

Project: Oyster River Dam at Mill Pond
Location: Durham, NH
Estimator: DWC
Checked By: LC

Mechanical Dredging - Area 2

Item No.	Qty.	Unit	Description	Unit Cost	Amount
203.4	4820	CY	MUCK EXCAVATION	$ 11.00	$ 53,020.00
203.35	4820	CY	HANDLING EXCAVATED CONTAMINATED SOILS	$ 34.00	$ 163,880.00
-	1286	SY	TEMPORARY SWAMP MATS	$ 25.00	$ 32,150.00
-	680	LF	6 FT SUPERSACK COFFERDAM WITH POLY SHEETING	$ 200.00	$ 136,000.00
-	49	CF	SUMP HOLE CONSTRUCTON, INCL. EXCAVATION GRAVEL, F	$ 2.21	$ 108.29
-	24	DAY	PUMP INSTALLATION AND RETRIEVAL PER PUMP PER DAY	$ 243.00	$ 5,832.00
-	720	DAY	ADDITIONAL PUMPING PER PUMP PER DAY	$ 79.00	$ 56,880.00
				Option Subtotal	$ 447,870.29

Hydraulic Dredging - Area 2

Item No.	Qty.	Unit	Description	Unit Cost	Amount
203.383	4820	CY	LIVE LOADING CONTAMINATED SOILS	$ 10.00	$ 48,200.00
-	1000	LF	15' TURBIDITY CURTAIN	$ 40.00	$ 40,000.00
-	1	LS	ADDITIONAL BOATS	$ 10,000.00	$ 10,000.00
-	8194	LF	GEOTUBES (5 FT DIA)	$ 6.00	$ 49,164.00
-	1	LS	PUMPING SYSTEM	$ 50,000.00	$ 50,000.00
-	1	LS	ADDITIONAL DEWATERING BAG MATERIALS	$ 30,000.00	$ 30,000.00
-	5463	SY	REINFORCED POLYETHYLETE LINER	$ 11.25	$ 61,458.75
-	5463	SY	FILTRATION FABRIC	$ 15.00	$ 81,945.00
-	887	FT	SEDIMENT CONTROL BARRIER	$ 8.00	$ 7,096.00
-	100	LB	DISPOSAL OF GRANULAR ACTIVATED CARBON	$ 8.00	$ 800.00
-	30	DAY	EQUIPMENT RENTAL CONTINGENCY	$ 500.00	$ 15,000.00
				Option Subtotal	$ 393,663.75

Mechanical Dredging - Area 3

Item No.	Qty.	Unit	Description	Unit Cost	Amount
203.4	2940	CY	MUCK EXCAVATION	$ 11.00	$ 32,340.00
203.35	2940	CY	HANDLING EXCAVATED CONTAMINATED SOILS	$ 34.00	$ 99,960.00
-	944	SY	TEMPORARY SWAMP MATS	$ 25.00	$ 23,600.00
-	520	LF	6 FT SUPERSACK COFFERDAM WITH POLY SHEETING	$ 200.00	$ 104,000.00
-	49	CF	SUMP HOLE CONSTRUCTON, INCL. EXCAVATION GRAVEL, F	$ 2.21	$ 108.29
-	20	DAY	PUMP INSTALLATION AND RETRIEVAL PER PUMP PER DAY	$ 243.00	$ 4,860.00
-	600	DAY	ADDITIONAL PUMPING PER PUMP PER DAY	$ 79.00	$ 47,400.00
				Option Subtotal	$ 312,268.29

Hydraulic Dredging - Area 3

Item No.	Qty.	Unit	Description	Unit Cost	Amount
203.383	2940	CY	LIVE LOADING CONTAMINATED SOILS	$ 10.00	$ 29,400.00
-	1000	LF	15' TURBIDITY CURTAIN	$ 40.00	$ 40,000.00
-	1	LS	ADDITIONAL BOATS	$ 10,000.00	$ 10,000.00
-	4998	LF	GEOTUBES (5 FT DIA)	$ 6.00	$ 29,988.00
-	1	LS	PUMPING SYSTEM	$ 50,000.00	$ 50,000.00
-	1	LS	ADDITIONAL DEWATERING BAG MATERIALS	$ 30,000.00	$ 30,000.00
-	3332	SY	REINFORCED POLYETHYLETE LINER	$ 11.25	$ 37,485.00
-	3332	SY	FILTRATION FABRIC	$ 15.00	$ 49,980.00
-	693	FT	SEDIMENT CONTROL BARRIER	$ 8.00	$ 5,544.00
-	100	LB	DISPOSAL OF GRANULAR ACTIVATED CARBON	$ 8.00	$ 800.00
-	30	DAY	EQUIPMENT RENTAL CONTINGENCY	$ 500.00	$ 15,000.00
				Option Subtotal	$ 298,197.00

2 Bedford Farms Drive
Suite 200
Bedford, NH 03110
603.391.3900

Date: 6/8/2020
Job Number: 52633
Percent Complete: Preliminary

Project: Oyster River Dam at Mill Pond
Location: Durham, NH
Estimator: DWC
Checked By: LC

Off-Site Disposal for Area 1

Item No.	Qty.	Unit	Description	Unit Cost	Amount
181.11	3,524	TON	DISPOSAL OF UNREGULATED SOIL	$ 40.00	$ 140,976.00
181.12	1,762	TON	DISPOSAL OF REGULATED SOIL IN-STATE FACILITY	$ 60.00	$ 105,732.00
				Subtotal	$ 246,708.00

Off-Site Disposal for Area 2

Item No.	Qty.	Unit	Description	Unit Cost	Amount
181.12	7,230	TON	DISPOSAL OF REGULATED SOIL IN-STATE FACILITY	$ 60.00	$ 433,800.00
				Subtotal	$ 433,800.00

Off-Site Disposal for Area 3

Item No.	Qty.	Unit	Description	Unit Cost	Amount
181.12	4,410	TON	DISPOSAL OF REGULATED SOIL IN-STATE FACILITY	$ 60.00	$ 264,600.00
				Subtotal	$ 264,600.00

Construction Monitoring and Engineering Services

Item No.	Qty.	Unit	Description	Unit Cost	Amount
100.	1	LS	SCHEDULE OF OPERATIONS - FIXED PRICE	$ 15,000.00	$ 15,000.00
180.01	1	LS	ENVIRONMENTAL HEALTH AND SAFETY PROGRAM	$ 5,500.00	$ 5,500.00
180.02	100	HR	PERSONAL PROTECTION LEVEL C UPGRADE	$ 10.00	$ 1,000.00
-	160	HR	PROFESSIONAL ENGINEERING SERVICES	$ 150.00	$ 24,000.00
756.	1	LS	NPDES STORMWATER POLLUTION PREVENTION PLAN	$ 5,000.00	$ 5,000.00
148.02	1	LS	BATHYMETRIC POST-CONSTRUCTION SURVEY	$ 15,000.00	$ 15,000.00
				Subtotal	$ 65,500.00

Appendix D:
Sediment Evaluation Supporting Documents

Appendix D.1:
June 2020 Sediment Sampling Analysis Plan

FINAL Sediment Sampling and Analysis Plan

Sediment Evaluation for Feasibility Study

Oyster River Dam at Mill Pond

PREPARED FOR

1732

Town of Durham
Department of Public Works
100 Stone Quarry Drive
Durham, NH, 03824
603.868.5578

PREPARED BY

vhb

2 Bedford Farms Drive, Suite 200
Bedford, NH 03110
603.391.3900

JUNE 2020

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1

Introduction

The Town of Durham, New Hampshire has contracted with VHB, and our partners Pare Corporation (Pare) and Weston & Sampson (W&S), to conduct a Feasibility Study (Study) of the Oyster River dam located at Mill Pond in Durham. The 100-year-old dam has been the subject of various Town-sponsored engineering studies and inspections by the New Hampshire Department of Environmental Services (NHDES) Dam Bureau over the last several decades, which have documented its deteriorating condition. In 2018, the NHDES issued a Letter of Deficiency (LOD) to the Town stating that that the dam lacks adequate discharge capacity for the 50-year flood event, which does not comply with the current state regulations for low-hazard structures (Env-Wr 303.11). The LOD requires the Town to develop a plan for corrective action by December 2020.

The purpose of the Feasibility Study is to characterize the existing environmental conditions at the Mill Pond impoundment and evaluate various alternatives to address noted deficiencies, including dam rehabilitation and removal. The Study will be used to supplement previous investigative work on the subject and facilitate the Town's selection of a preferred alternative in advance of the LOD's response deadline.

A key component of the Study is to assess the potential for adverse effects on water quality and benthic conditions downstream of the existing dam location from increased sediment migration associated with a possible 'dam-out' alternative. Risk factors include the relative amount of sediment likely to be mobilized by dam removal, which is largely dependent on physical nature of the deposits (i.e., thickness, stratigraphy, and grain size distribution), and the level of chemical contamination associated with the sediments (NHDES, 2016; NHDES, 2018). Although some relevant data can be used from previous studies, additional information is needed to adequately characterize the accumulated sediment within the impoundment in support of the sediment evaluation for the larger Feasibility Study. The purpose of this Sediment Sampling and Analysis Plan (SAP) is to inform and guide the collection of that supplemental field and analytical data. The subsequent sections of this SAP present the background information, which provides the basis for the recommended sampling and analysis program (**Section 2**); field and analytical methods to be used to generate the data (**Sections 3 and 4**); quality control measures to be implemented as part of the study (Section 5); and, data evaluation and reporting procedures (**Section 6**).

2

Project Background

This section of the SAP provides a brief overview of the Oyster River dam / Mill Pond site and summarizes the results of VHB's due diligence review of available environmental data and information. Based on this review and subsequent data gap analysis, VHB developed a recommended supplemental data collection approach, which is detailed in the subsequent sections of this plan.

2.1 Site Description

The Mill Pond is a highly visible, iconic water feature located at the eastern gateway to Durham (see **Figure 1).** The 9.5-acre impoundment within the Oyster River is formed by the Oyster River Dam, also referred to as Mill Pond Dam (NHDES Dam #071.03). The Amberson-style dam was originally constructed in 1913 and is now over 100 years old. The pond is relatively shallow with nearly half of the impoundment having less than 3 feet of water. The backwater effect of the dam extends approximately 3,700 feet up the Oyster River channel from the point where the river enters the pond.

The dam's location at the head of tidewater of the Oyster River is ecologically significant. The Oyster River is a major tributary of the Great Bay, one of the largest estuaries on the East Coast, with an area of approximately 6,000 acres. Thus, the river provides important habitat for diadromous fish species, which use the river and its tributaries for spawning and nursery habitat. Mill Pond itself supports habitat for both aquatic species and waterfowl. The dam was renovated in the 1970s to address significant deterioration. At that time, the Town worked with the NH Fish and Game Department (NHF&G) to install a denil fish ladder at the dam to create a means of upstream fish passage.

In addition to the previously noted structural concerns associated with the dam, declining water quality conditions have been observed in the Mill Pond impoundment of the Oyster River, presumably due in part to periodic stagnant water conditions. NHDES' 303(d) list of impaired water bodies identifies the Oyster River/Mill Pond segment as being impaired for occasional low dissolved oxygen levels and elevated chlorophyll *a* level (a measure of algal productivity in the water column). These two impairments negatively affect the integrity of the aquatic life and recreational uses, respectively, and indicate eutrophic conditions typical of impounded water bodies. In addition, the downstream estuarine portion of the Oyster River is listed as impaired due to low dissolved oxygen levels and reduced water clarity which are typical indicators of nutrient enrichment which has been linked to nitrogen contributions.

2.2 Due Diligence Review

This section summarizes VHB's review of existing sediment data and environmental information, which was considered in the development of a supplemental sampling and analysis program.

2.2.1 NHDES Environmental Database Search

VHB conducted a review of the searchable online environmental database ("OneStop") maintained by the NHDES, to identify contaminant sources that may have the potential to impact sediment quality within the Mill Pond dam impoundment. The database was queried to identify state regulated sites (e.g., storage tank facilities, hazardous waste generators, remediation sites) located within one mile from the Mill Pond dam and within the dam watershed (i.e., area of interest). The results of this query are summarized in the table below; graphical and detailed tabular outputs from the database query are also provided in **Appendix A**.

Table 1 Summary of Environmental Database Search Results

Type of Site	No. of Sites Located within the Area of Interest
Aboveground Storage Tank (AST) Sites	5
Underground Storage Tank (UST) Sites	12
Remediation Sites	26
Hazardous Waste Generators	4
Solid Waste Facilities	0
NPDES Outfalls	0
Local Potential Contamination Sites	0
TOTAL:	84

While the query results indicate that multiple regulated storage tank and hazardous waste generator sites are located within the area of interest, the presence of these facilities, in and of themselves, is not indicative of a release of contaminants to the environment. Of the 26 remediation sites identified, 22 of these sites have been closed, indicating that any associated contaminant release(s) have been mitigated to the satisfaction of the NHDES. Further review of available database records for the remaining four active remediations sites similarly indicate that any associated release(s) are unlikely to significantly impact sediment quality at the Mill Pond given their location and facility type.

In addition to this regulated site information, the Onestop Data Mapper provides access to the NHDES Environmental Monitoring Database (EMD), which is a repository of sampling data for a variety of environmental media collected from across the state. Chemical analysis results for multiple sediment samples collected downstream of the dam are available via the EMD (see **Appendix A**). This data can be used to compare potential differences in sediment chemistry based on more recent samples and especially upstream samples.

2.2.2 Previous Investigations

Bathymetric Survey and Sediment Sampling Study (VHB, 2009)

On behalf of the Town, VHB previously conducted a bathymetric survey and sediment sampling study of the Mill Pond area (VHB, 2009). As shown on **Figure 2**, twelve sediment samples were collected with eleven samples in the upstream impoundment (grab) and one downstream of the dam (composite) as part of this study. The samples were collected from depths up to 3 to 5 feet below the river bottom and analyzed for various parameters including, polychlorinated biphenyls (PCBs), pesticides, metals, polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), and grain size distribution.

The analytical results from the study, which are summarized in **Appendix B**, indicated concentrations of PCBs, pesticides, and VOCs were below the laboratory reporting levels in all samples, however, various PAH compounds, were detected in eight of the 12 sediment samples. Concentrations of various PAH compounds in these eight samples exceeded ecological screening criteria[1] selected for the study. The PAH concentrations were relatively similar throughout the impoundment, although the higher concentrations tended to be in samples collected in the off-channel, depositional areas just outside the main channel. The highest PAH concentrations were observed in a sample collected approximately 200 feet downstream of where Hamel Brook enters the impoundment. PAHs were below detection levels in samples collected closer to Mill Pond Road and farther away from the main channel. PAH compounds were also below detection levels in the downstream sample collected below the dam. PAHs are commonly associated with urban stormwater runoff and have been linked to driveway sealants and other pavement treatment products.

Metals including arsenic, cadmium, chromium, lead, and mercury were also detected in various sediment samples above the selected ecological screening criteria. Much like the PAHs, the detected metal concentrations in sediment did not vary much from one location to another. There were no distinct differences in the upstream sediment samples from those collected in the river channel versus those outside the river channel or from upstream of the dam to those downstream of the dam. These observations appear to hold true for arsenic and mercury, which were two of the most commonly detected metals. Arsenic has been found to be naturally abundant in the sediment and bedrock within New Hampshire. Mercury is predominantly contributed from atmospheric deposition associated with the stack emissions from major coal-fired power plants located mostly in the Midwest States.

UNH Sediment Study (Miller, H., 2019)

In 2019, a graduate student at the University of New Hampshire (UNH) completed a research project, which involved the characterization of sediment samples from two local dam impoundments (Mill Pond and Sawyer Mill Pond in Dover, NH) (Miller, H., 2019). As part of the study, surficial and core sediment samples were analyzed for grain size distribution and

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[1] The 2009 study compared the observed parameter levels to the 1999 NOAA Ecological Risk Screening Threshold Effect Concentrations (TECs) established for various parameters, which represent the lowest concentrations where aquatic organisms might be at risk of adverse effects from long-term exposure to contaminant levels in freshwater sediments.

mercury content. Research findings reportedly indicate that relatively homogenous, fine-grained sediment is located throughout the impoundment. Elevated levels of mercury (i.e., greater than the NOAA 1999 Upper Effects Threshold) were also reported at multiple locations within the impoundment, particularly at depths equal to or greater than 20 centimeters (about 8 inches). It was also reported that depositional areas adjacent to the main channel were more likely to contain fine-grained sediment, and therefore be associated with mercury contamination. In addition to air pollution from regional sources and possible upstream industrial sites, the former UNH waste incinerator, which closed in the 1980s, was identified as a possible local historical source of mercury contamination. A copy of the study analytical data summary appended to this report is provided in **Appendix C**.

2.3 Data Gap Analysis & Recommended Supplemental Data Collection Approach

VHB proposes to conduct an additional supplemental sampling effort to collect up to six (6) samples at various locations for chemical analysis and grain size distribution to address any potential data gaps and to verify that the sediment chemistry conditions are similar to those observed in 2009. The previous sediment sampling study collected samples from most of the impoundment area (i.e., immediately upstream of the dam to the upper limits of the impoundment) as well as immediately downstream of the dam. This new data as well as other more recent data collected by UNH students, as discussed above, will be used to supplement the characterization of sediment chemistry above and below the dam. Samples will be collected in areas where data may be limited such as the upper limits of the Hamel Brook channel and farther downstream below the dam where the channel widens out into a more estuarine environment. VHB proposes to collect at least one additional sample in each of these locations for sediment chemistry analysis. In addition, VHB will collect samples at two similar impoundment locations that were done in 2009 and immediately downstream of the dam. The impoundment locations will target the area where the highest levels of PAHs were observed in the previous sampling.

Based on the previous sediment data, VHB proposes to analyze the additional samples for PAHs and metals (RCRA 8), as well as for PCBs and pesticides due to their persistent, bioaccumulative and/or toxic properties (NHDES, 2005). Because volatile organic compounds (VOCs) were not detected in the previous sampling effort, VOC testing is not considered necessary for the additional sampling. Total phosphorous and nitrogen are also recommended for testing given the downstream water quality impairments.

As discussed above, review of NHDES' environmental monitoring database did not reveal any additional contaminant sources and/or individual chemical constituents of concern that should be included in the supplemental sampling and analysis program. Testing for per- and polyfluoroalkyl substances (PFAS) is not recommended at this time since the presence of these compounds are not anticipated given the due diligence review findings.

The proposed sampling locations are discussed in the next section.

3

Field Sampling Procedures

This section of the SAP outlines the methods and protocols to be implemented during the field sample and data collection program. In general, the sampling collection methods will be consistent with the U.S. Environmental Protection Agency's (USEPA's) Methods for Collection, Storage, and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual (USEPA, 2001).

3.1 Sediment Sampling Locations

A total of six (6) supplemental samples are planned for this effort at various locations relative to the dam, as described in the following table:

Table 2 Proposed Supplemental Sediment Sampling Scheme

Sample ID	Sample Location Description	Grain Size Analysis	Chemical Analysis	Rationale
SED-13	Hamel Brook upstream near impoundment limits	1	1	Address spatial data gap upstream of sample with elevated levels of PAHs
SED-14	Hamel Brook upstream between SED-13 and SED-1	1	1	Address spatial data gap upstream of sample with elevated levels of PAHs
SED-15	Main river channel upstream of dam (targeting previous sample locations SED-3)	1	1	Confirm existing data is representative of current conditions; supplement existing impound data
SED-16; SED-16MS; SED-16MSD; SED-FD; SED-EB[1]	Main river channel upstream of dam (targeting previous sample locations SED-7 or SED-8)	1	5	Confirm existing data is representative of current conditions; supplement existing impound data
SED-17 A-E, SED-18 A-E[2]	Downstream of Mill Pond dam in tidal estuary	2	2	Supplement existing downstream data
	Total:	6	6	

Notes:

1. VHB plans to collect field quality control samples from this sampling location; however, actual location will be determined in the field based on the amount of material available (i.e., where sufficient sediment material is available). MS - matrix spike; MSD indicates matrix spike duplicate; FD – field duplicate; EB – equipment blank.

Figure 3 shows the general locations of each of the proposed sediment samples. The actual locations of all samples will be determined in the field based on a review of local site conditions, availability of access, riverbed substrate, as well as potential equipment limitations. The final sampling location selection will be determined in the field as targeted locations may shift depending on whether there is sufficient sediment deposits available to collect sediment material for all proposed parameters.

Sampling locations will be geo-referenced using a Trimble ProXT GPS Unit (or similar) capable of achieving sub-meter horizontal accuracy. A minimum of 60 GPS positions will be collected at each location to ensure that at least 90% of the GPS data is sub-meter accuracy. GPS data will be post-processed using Trimble GPS Analyst with Trible Delta Phase technology. Sampling locations will be reported in latitudes and longitudes (to the nearest hundredth of a second) or in state plane coordinates, relative to the North American datum (NAD) 1983. Additional Field instrument operation/maintenance requirements are discussed in Section 5.2.

3.2 Field Sampling Methods

Consistent with the 2009 study (VHB, 2009), the supplemental sediment samples will be collected using hand and gravity coring techniques (e.g., Wildco® Hand Corer or similar). Prior to sample collection, the approximate depth of unconsolidated sediment deposits at each location will be estimated based on sediment probing using stainless steel rods. The upstream samples within impoundment will be retrieved as distinct sediment cores and the sampling equipment will be manually advanced through the soft sediments into the more dense silty clay material below, which is anticipated to be three to five feet below the river bottom (or shallower if refusal is encountered). Consistent with the 2009 study, the downstream samples will be composited from multiple (four to five) sediment cores collected from the top one-foot interval along transects perpendicular to the stream channel at the selected locations (see Figure 3).

Once collected, the core sample(s) will be photographed and visually observed for sediment texture, color, or debris content. Each core sample (or samples in the case of the downstream composite samples) will then be transferred to a clean, stainless-steel bowl and mixed using a stainless-steel spoon or spatula, prior to filling the sample containers. The field sampling activities will be documented using the field data sheet provided in Appendix D, which will be completed for each sampling location.

3.3 Sample Handling & Custody Protocols

The homogenized sediment material will be immediately transferred into clean, unused, laboratory-supplied sample containers. Sample container, preservation, and holding time requirements are provided in the table below.

Table 3 Sample Handling Requirements

Parameter	Analytical Method	Sample Containers	Sample Preservation	Holding Time
Metals (RCRA 8)	EPA 6020 and 7471	4 oz. glass jar	4 ± 2°C	28 days (Hg); 180 days
PCBs	EPA 8082	4 oz. glass jar	4 ± 2°C	1 year
PAHs	EPA 8270	4 oz. amber glass jar	4 ± 2°C	14 days
Pesticides	EPA 8081	4 oz. amber glass jar	4 ± 2°C	14 days
Total Phosphate	EPA 365.3	4 oz. glass jar	4 ± 2°C	28 days
Total Nitrogen	EPA 350.1	4 oz. glass jar	4 ± 2°C	7 days
TOC	EPA 9060	4 oz. glass jar	4 ± 2°C	28 days
Grain Size	ASTM D-422	1000 mL plastic jar	N/A	N/A

Labels will be affixed to each sample container with the following information: project identification (ID), sample ID, sample date/time, sampler's initials, laboratory analysis required, and preservative used (if applicable). The container lids will be fastened securely.

All sample containers will be carefully packed in cooler(s) with bubble wrap or other suitable packaging material to avoid breakage. The cooler(s) also will be packed with bagged ice and a temperature blank to verify the cooler temperature upon arrival at the laboratory.

VHB will deliver the packed coolers directly to the contract laboratory, under standard chain-of-custody protocols, to track the possession and handling of individual samples from the time of field collection through laboratory analysis. Samples and unused sample containers will remain in the sample collector's view at all times, unless locked in a vehicle or other secured location.

3.4 Decontamination & Waste Handling Protocols

All equipment that comes into direct contact with the sediment collected for analysis will be dedicated (i.e., single use) or made of stainless-steel to facilitate proper decontamination. Sampling equipment will be decontaminated at the point-of-use, before introducing it to a sampling location, and after completion of work at a particular sampling point. Trace decontamination of small equipment follows removal of solids and gross contamination and generally consists of washing with a laboratory-grade, phosphate-free, detergent (e.g., Liquinox®), and rinsing with ambient (site) or distilled water, prior to a final triple rinse with deionized water. Equipment may be air dried or wiped dry with paper towels.

Decontamination (wash/rinse) waters may be discharged to the ground surface in the vicinity of the sampling location provided no evidence of gross contamination is observed.

Excess sediment material not used to fill sample containers may also be returned to the immediate vicinity from which it was collected provided no evidence of gross contamination is observed.

All other investigation-derived waste (e.g., personal protective equipment [PPE}, plastic wrappers, etc.) will be collected and appropriately disposed off-site as solid waste.

4

Laboratory Analytical Methods

Sediment samples will be submitted to a New Hampshire Environmental Laboratory Accreditation Program (NHELAP)-accredited laboratory for analysis of the following chemical contaminants:

- RCRA 8 list of metals, including arsenic (As), barium (Ba), cadmium (Cd), chromium (Cr), lead (Pb), mercury (Hg), selenium (Se), and silver (Ag) by United States Environmental Protection Agency (EPA) methods 6020 and 7471 (mercury only);
- Polychlorinated biphenyls (PCBs) by EPA method 8082;
- Polycyclic aromatic hydrocarbons (PAHs) by EPA method 8270;
- Organochlorine pesticides by EPA method 8081;
- Total Phosphate by EPA method 365.3; and
- Total Nitrogen by EPA method 350.1.

Sediment samples will also be analyzed for total organic content (TOC) by EPA method 9060 and grain size by ASTM method D-422.

Sample container, preservation, and holding time requirements are provided in Section 3.3. Laboratory reporting limits for each target analyte are provided in Appendix E.

5

Quality Control Measures

This section describes the quality control measures, which will be implemented during the supplemental sampling and analysis program to ensure the validity of the resulting data.

5.1 Field Quality Control

A summary of planned field quality control samples is provided in the table below:

Table 4 Field Quality Control Sample Requirements

QC Item	Frequency	Acceptance Criteria	Corrective Action
Field Duplicate Sample	One per 10 samples	Duplicate results have an RPD of less than or equal to 50% for inorganic analyses.	Reanalyze samples or review similarity of samples.
Matrix Spike/ Matrix Spike Duplicate	One per 20 samples	Matrix spike sample results between 75 and 125% of actual concentrations; RPD between MS and MSD < 15 to 20%	Note deviation in report.
Equipment Blank	One per mobilization (select analyses)	No detections at or above reported detections for associated samples.	Review decontamination procedures. Resample if necessary.
Cooler Temperature Blank	One per cooler	4 ± 2°C	Document in the laboratory report. Alter packing and shipping procedures as required.

The sampling location at which the field quality control samples will be collected will be determined in the field based on the amount of material available (i.e., where sufficient sediment material is available).

5.2 Equipment Maintenance and Calibration

In general, field sampling equipment and instruments including, but not limited to, sediment corer, GPS receiver, and PID, will be maintained, tested, and inspected according to the manufacturer's instructions. All equipment/instruments will be inspected for signs of defects prior to field deployment by VHB. The sediment corer kit will be inspected to ensure that all the parts to the kit are included; any malfunctioning, broken, or missing components will be repaired or replaced. Field equipment/instrument performance and corrective action requirements are summarized in the table below.

Table 5 Field Equipment Performance and Corrective Action Requirements

Equipment	Activity	Frequency of activity	Acceptance criteria	Corrective action	Person responsible
Sediment Corer	Inspect/ clean	Prior to each sample	No defects/ clean, unused plastic sleeve	Replace as necessary	VHB Field Staff
GPS Receiver (Trimble ProXT or equivalent)	Record sampling location coordinates	At each sample location	Minimum satellite coverage	Post-field Data Analysis	VHB Field Staff / VHB GIS Specialist

5.3 Data Verification & Validation

Verification and validation of the data generated during the supplemental sampling program will be performed to determine the usability of the data relative to project objectives and to ensure results are generated in accordance with the procedures defined in this SAP. Verification of the field sampling procedures used will be performed first by the field staff or sampler, and then by the VHB Project Manager (or designee). The Project Manager will review all field forms for completeness by making sure all entries on the data sheets are filled out. The Project Manager will also verify any questionable entries by speaking to the field staff/sampler and noting any unusual or anomalous data in the project files.

The VHB Project Manager (or designee) will review all sediment data results and evaluate laboratory QC notes to assess usability relative to project objectives. The Project Manager’s review will include checking holding times, proper chain-of-custody documentation, acceptable detection limits, surrogate recoveries, duplicate results, and MS/MSD results. The results of the data review will be summarized in the final report. Any decisions made regarding the usability of the data will be left to the VHB Project Manager; however, the VHB Project Manager may consult with project personnel, the Town of Durham, or NHDES. Given the scope and objectives of the project, independent third-party verification/validation is not considered necessary.

6

Data Evaluation and Reporting

Laboratory analytical results obtained during this study will be summarized in cross-tabular format for comparison to applicable screening-level ecological reference values. Specifically, VHB proposes to use the consensus-based threshold effect concentration (TEC) and probable effect concentration (PEC) for freshwater species, as well as threshold effect level (TEL) and probable effect level (PEL) for aquatic species, from the most recent National Oceanic and Atmospheric Administration (NOAA) Screening Quick Reference Tables (SQuiRT) Tables (Buchman, 2008), a copy of which is provided in Appendix F. Following the procedure outlined in NHDES guidance (NHDES, 2005), detected concentrations of target analytes will be qualified as low, moderate, or high risk. In addition, sample results will be compared to applicable NHDES Contaminated Sites Risk Characterization and Management Policy (RCMP) Method 1 Category S-1 Soil Standards (equivalent to NHDES Soil Remediation Criteria, Env-Or 606.19) to assess potential handling and/or disposal concerns in the event that sediment removal actions are needed to implement the preferred alternative.

Following data evaluation, VHB will prepare a brief sediment sampling and analysis report (technical memorandum), which documents the field activities completed, presents an assessment of potential sediment contamination considerations based on the screening-level risk assessment, and provides recommendations for further analysis, if applicable. Report attachments will also include copies of field documentation and laboratory analytical data reports.

7

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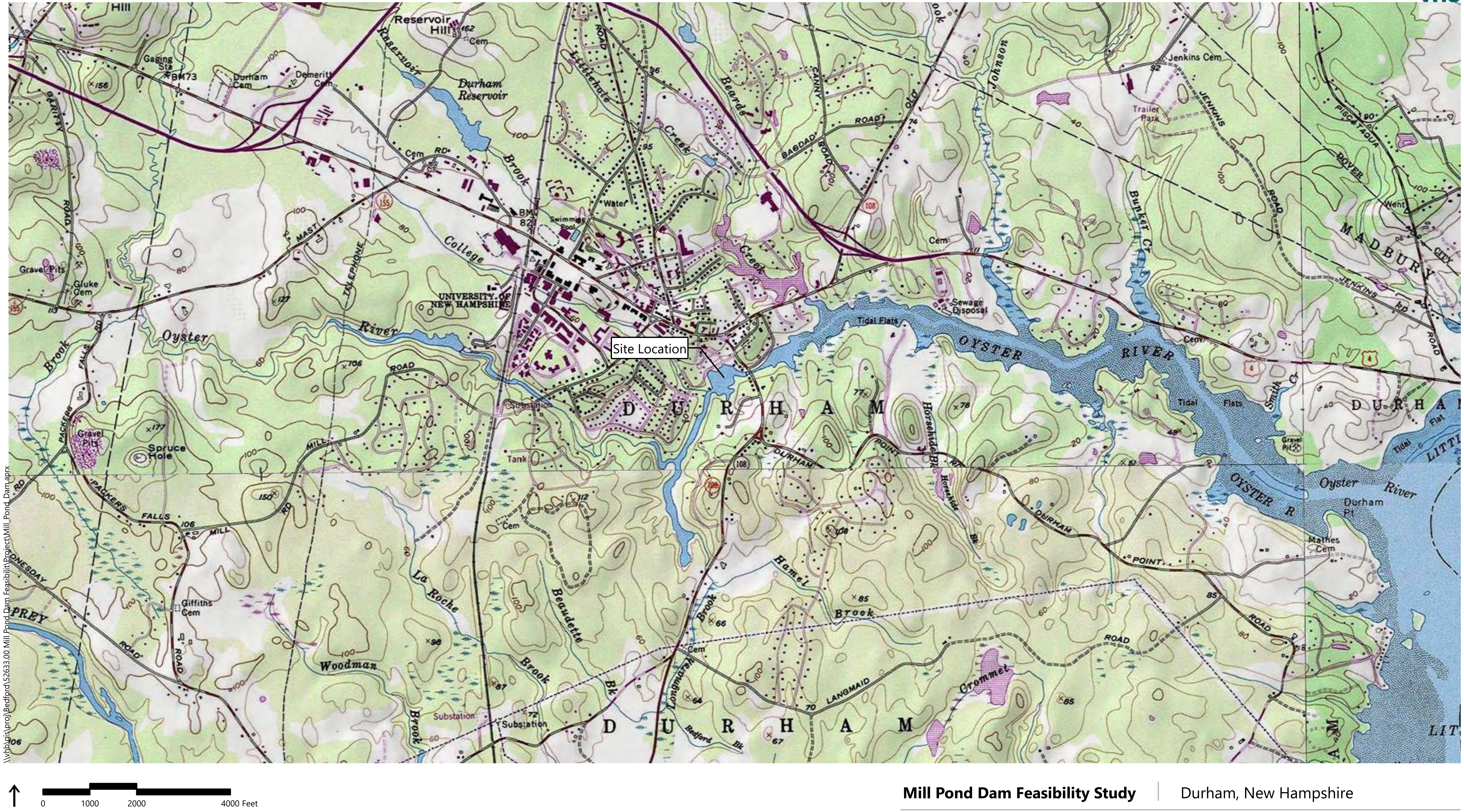
Figures



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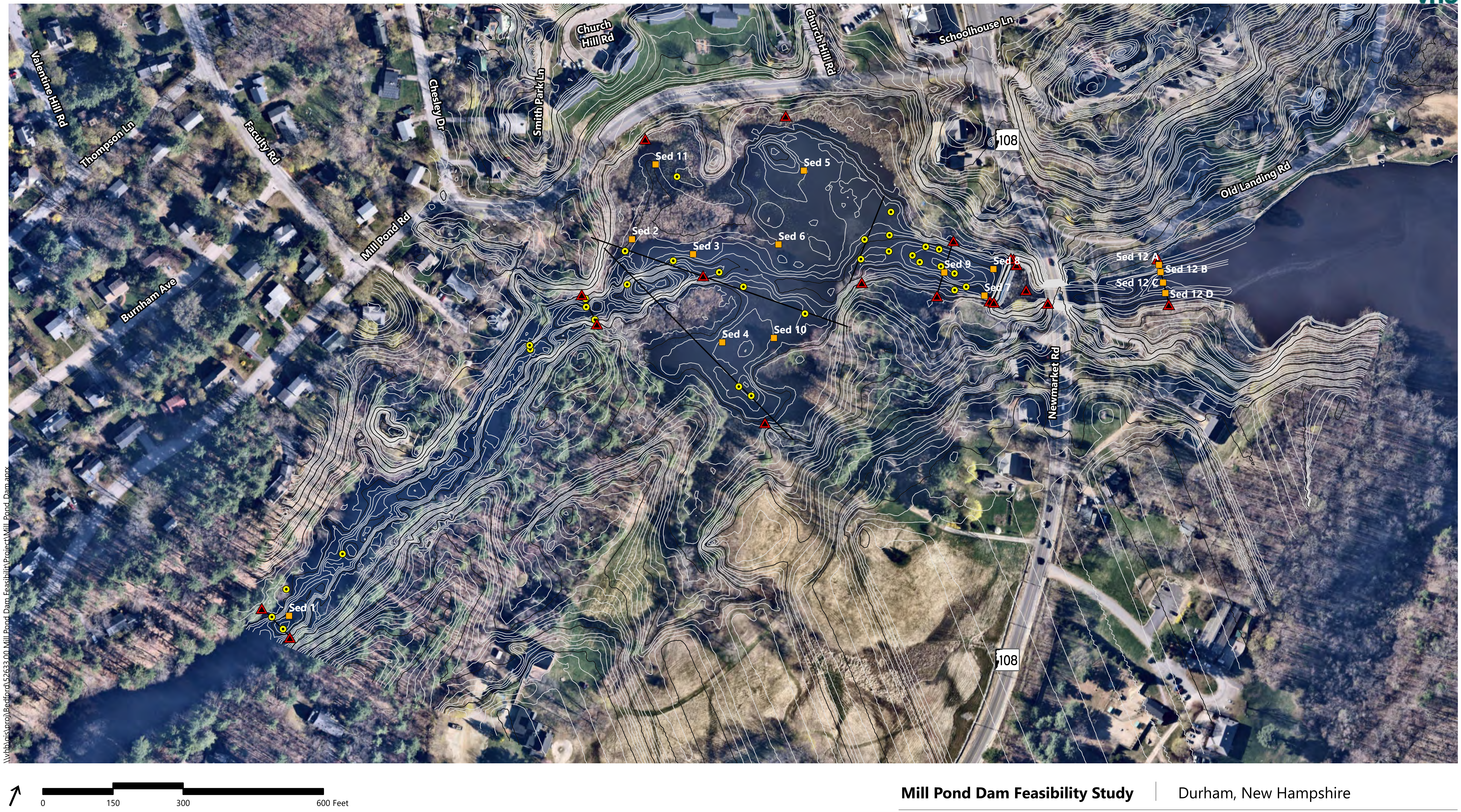
Mill Pond Dam Feasibility Study | Durham, New Hampshire

Source : NHDES, VHB, ArcGIS Online

Figure 1
Site Location Plan

Sediment Sampling and Analysis Plan



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▲ Ground Survey Point (VHB)

● Probe Location

■ Sediment Sampling Locations

— Transect Lines

— Index Contour

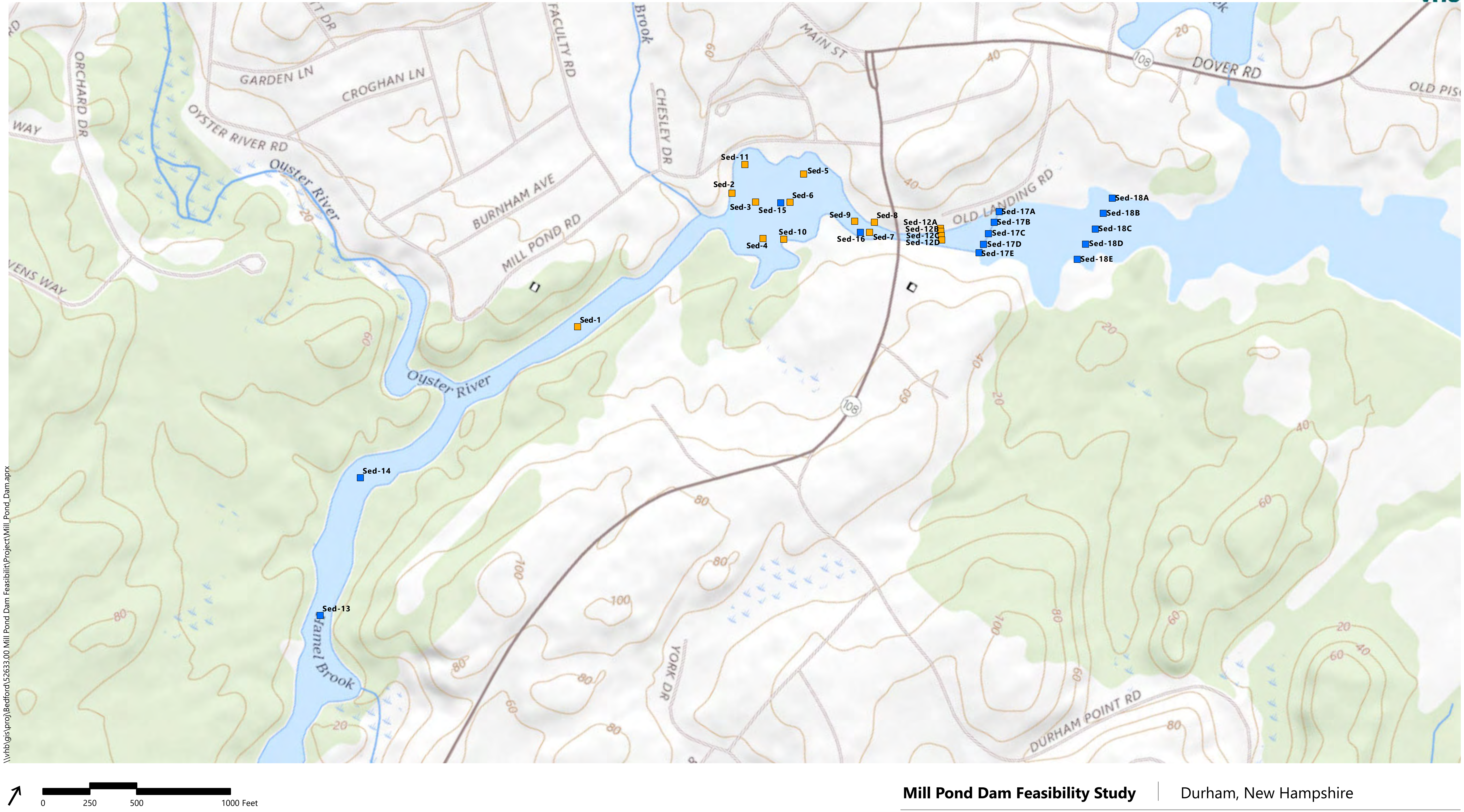
— 1' Contour Intervals

Mill Pond Dam Feasibility Study | Durham, New Hampshire

Source : NHDES, VHB, ArcGIS Online

Figure 2
2009 Exploration Location Plan

Sediment Sampling and Analysis Plan



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🟧 2009 Sediment Sampling Locations

🟦 Proposed Sampling Location

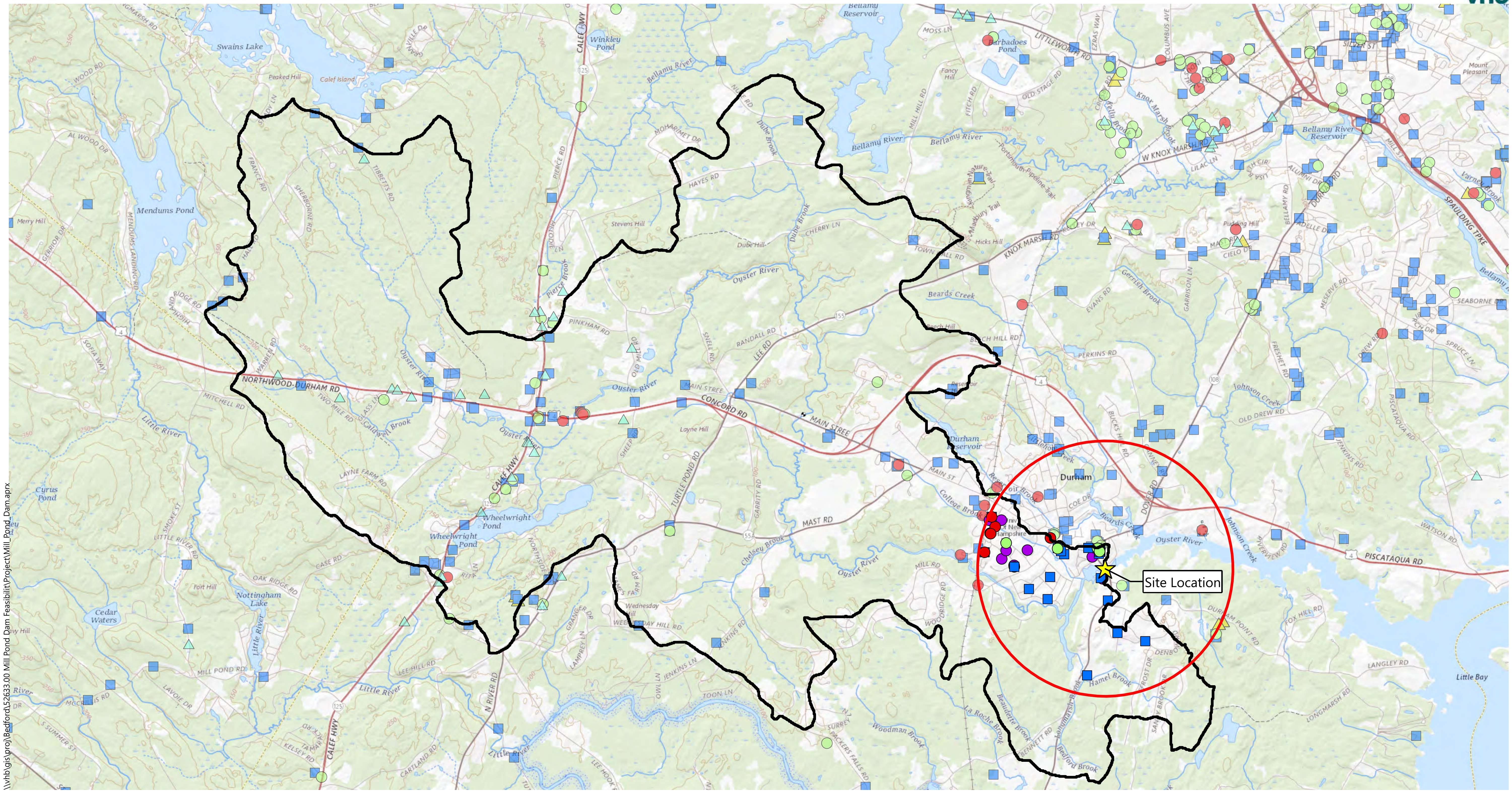
Mill Pond Dam Feasibility Study | Durham, New Hampshire

Source : NHDES, VHB, ArcGIS Online

Figure 3
Proposed Sediment Sampling Location Plan

Sediment Sampling and Analysis Plan

Appendix A:
NHDES Environmental Database Search Results



↑

0 2000 4000 8000 Feet

☆ Mill Pond Dam Reference Point

▭ 1 Mile Buffer from Reference Point

▭ Mill Pond Dam Watershed

NHDES Resources Outside AOI

△ Local Potential Contamination Source

⊙ NPDES Outfall

● Underground Storage Tank Site

▲ Solid Waste Facilities

■ Remediation Site

● Hazardous Waste Generator

○ Automobile Salvage Yard

● Aboveground Storage Tank Site

■ Asbestos Disposal Site

NOTE: Watershed Delineation from USGS StreamStats

Mill Pond Dam Feasibility Study | Durham, New Hampshire

Source : NHDES, VHB, ArcGIS Online

NHDES Environmental Database Search Results - Vicinity Plan

Sediment Sampling and Analysis Plan

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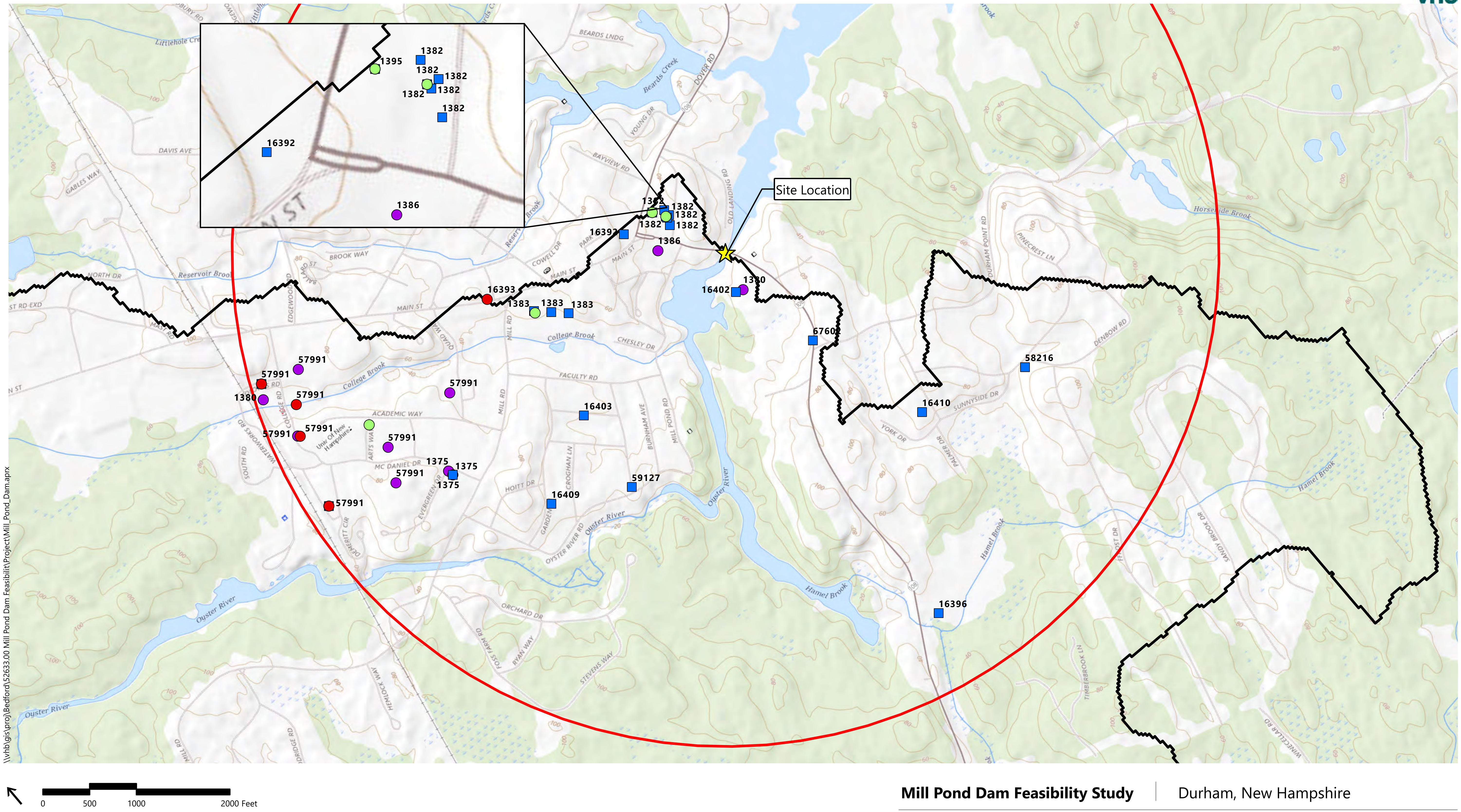

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☆ Mill Pond Dam Reference Point

▭ 1 Mile Buffer from Reference Point

▭ Mill Pond Dam Watershed

NHDES Resources AOI

● Underground Storage Tank Site

■ Remediation Site

● Hazardous Waste Generator

● Aboveground Storage Tank Site

NOTE: Watershed Delineation from USGS StreamStats

Mill Pond Dam Feasibility Study | Durham, New Hampshire

Source : NHDES, VHB, ArcGIS Online

NHDES Environmental Database Search Results - Area of Interest

Sediment Sampling and Analysis Plan

NHDES Environmental Database Search Results

Aboveground Storage Tank Sites

FID	Shape	MASTERID	SITE_NO	FAC_NO	FACILITY	ADDRESS	TOWN	FAC_TYPE	GIS_TYPE	TANK_NO	COLL_METHO	LONGITUDE	LATITUDE
87	Point	16393	199501045	950145A	GANGWER REALTY INC	56 MAIN ST	DURHAM	COMMERCIAL	AST			-70.926964	43.134466
94	Point	57991	200303059	7	UNIVERSITY OF NEW HAMPSHIRE	MAIN ST	DURHAM	COLLEGE/UNIVERSITY	AST_TANK			-70.935512	43.135784
153	Point	57991	200303059	7	UNIVERSITY OF NEW HAMPSHIRE	MAIN ST	DURHAM	COLLEGE/UNIVERSITY	AST_TANK			-70.937178	43.132903
192	Point	57991	200303059	7	UNIVERSITY OF NEW HAMPSHIRE	MAIN ST	DURHAM	COLLEGE/UNIVERSITY	AST_TANK			-70.936222	43.135005
198	Point	57991	200303059	7	UNIVERSITY OF NEW HAMPSHIRE	MAIN ST	DURHAM	COLLEGE/UNIVERSITY	AST_TANK			-70.936032	43.136911

NHDES Environmental Database Search Results

Hazardous Waste Generators

FID	Shape	DESID	MASTERID	RCRA_	SITE_NAME	ADDRESS	ADDRESS2	TOWN	GEN_TYPE	GEN_SIZE	GEN_STATUS	X_COORD	Y_COORD
119	Point	11693	40761	NHD000790923	UNIVERSITY OF NEW HAMPSHIRE	11 LEAVITT LN	PERPETUITY HALL	DURHAM	RCRA REGULATED	FQG1(LQG)	ACTIVE	1179867.5	231895.625
200	Point	16608	40770	NHD510000870	RITE AID 10295	5 MILL RD	UNIT G	DURHAM	RCRA REGULATED	SQG(CESQG)	ACTIVE	1181995.896	231662.761
269	Point	15825	1395	NHD510051170	DURHAM CIRCLE K 7241	4 DOVER RD	RTE 108	DURHAM	RCRA REGULATED	NONE	INACTIVE	1183647	231672.8281
372	Point	10331	1382	NHD986483477	DURHAM TOWN OF	SCHOOLHOUSE LN		DURHAM	RCRA REGULATED	SQG(CESQG)	INACTIVE	1183730.625	231545.6094

NHDES Environmental Database Search Results

Remediation Sites

FID	Shape	MASTERID	SITE_NO	FACILITY	ADDRESS	TOWN	PROJ_TYPE	PROJ_NO	STAFF	WLP	RISK	COLL_METHO	LONGITUDE	LATITUDE
22	Point	57991	200303059	UNIVERSITY OF NEW HAMPSHIRE	MAIN ST	DURHAM	LAST	12200	CLOSED	3	8		-70.937178	43.132903
79	Point	1395	198906040	DURHAM CIRCLE K	4A DOVER RD	DURHAM	HAZWASTE	12694	CLOSED	3	8		-70.91968	43.133234
113	Point	1382	199312048	DURHAM PUBLIC WORKS DEPARTMENT	15 NEWMARKET RD	DURHAM	UIC	10359	CLOSED	3	8		-70.919477	43.132615
123	Point	1383	199308004	DURHAM SHOPPING PLAZA	5 MILL RD	DURHAM	LUST	4407	CLOSED	3	8		-70.924854	43.132598
164	Point	16410	199612008	ZARROW RESIDENCE	12 SUNNYSIDE DRIVE	DURHAM	OPUF	6694	CLOSED	3	8		-70.916714	43.123625
204	Point	1382	199312048	DURHAM PUBLIC WORKS DEPARTMENT	15 NEWMARKET RD	DURHAM	HOLDTANK	6388	REGISTRATION	3	NDY		-70.919371	43.132883
344	Point	1382	199312048	DURHAM PUBLIC WORKS DEPARTMENT	15 NEWMARKET RD	DURHAM	HAZWASTE	8797	CLOSED	3	8		-70.919244	43.132856
414	Point	16392	199409018	GABRIEL APARTMENTS	4-6 MAIN ST	DURHAM	OPUF	5100	CLOSED	3	8		-70.921112	43.133294
431	Point	1382	199312048	DURHAM PUBLIC WORKS DEPARTMENT	15 NEWMARKET RD	DURHAM	LUST, HOLDTANK	10359	CLOSED, REGISTRATION	3, 3	8, NDY		-70.919371	43.132883
459	Point	57991	200303059	UNIVERSITY OF NEW HAMPSHIRE	MAIN ST	DURHAM	OPUF	12727	CLOSED-AUR	3	3		-70.936032	43.136911
467	Point	58216	200306002	PJ MAGUIRE PROPERTY	2 DENBOW RD	DURHAM	OPUF	12930	CLOSED	3	8		-70.912415	43.12265
544	Point	67602	201210089	MERRYWEATHER PROPERTY	OFF DURHAM PT	DURHAM	IRSPILL	29486	CLOSED	3	8	DESKTOP	-70.918151	43.127311
627	Point	16402	199308017	RUTH CHAMBERLIN	28 NEWMARKET RD P O BOX 628	DURHAM	OPUF	4425	CLOSED	3	8		-70.919223	43.129862
631	Point	16396	199311029	GREAT BAY ANIMAL HOSPITAL./KENNEL	27 NEWMARKET RD	DURHAM	UIC	4567	REGISTRATION	3	8		-70.921471	43.118837
632	Point	1383	199308004	DURHAM SHOPPING PLAZA	5 MILL RD	DURHAM	LUST	4407	CLOSED	3	8		-70.925352	43.132954
697	Point	1382	199312048	DURHAM PUBLIC WORKS DEPARTMENT	15 NEWMARKET RD	DURHAM	LUST	4633	CLOSED	3	8		-70.919371	43.132883
698	Point	1382	199312048	DURHAM PUBLIC WORKS DEPARTMENT	15 NEWMARKET RD	DURHAM	HAZWASTE	10359	UNASSIGNED	3	7		-70.919244	43.132857
811	Point	16409	199805058	YIGE WANG RESIDENCE	27 GARDEN LANE	DURHAM	OPUF	8450	CLOSED	3	8		-70.930364	43.12869
879	Point	57991	200303059	UNIVERSITY OF NEW HAMPSHIRE	MAIN ST	DURHAM	SPILL/RLS	12728	CLOSED	3	8		-70.936032	43.136911
898	Point	1375	199302013	CONSOLIDATED COMMUNICATIONS OF NORTHERN	MCDANIEL DR	DURHAM	LUST	4144	CLOSED	3	8		-70.932599	43.131222
905	Point	59127	200404078	LOWY RESIDENCE	17 THOMPSON LN	DURHAM	OPUF	13567	CLOSED	3	8		-70.927483	43.127523
982	Point	16403	199511027	RUTH EDWARDS	12 VALENTINE HILL ROAD	DURHAM	OPUF	6035	CLOSED	3	8		-70.927067	43.130032
1064	Point	1395	198906040	DURHAM CIRCLE K	4A DOVER RD	DURHAM	LUST	1079	PISKOVITZ	2	7		-70.91968	43.133234
1106	Point	1383	199308004	DURHAM SHOPPING PLAZA	5 MILL RD	DURHAM	LUST	4407	CLOSED	3	8		-70.925849	43.133309
1121	Point	1382	199312048	DURHAM PUBLIC WORKS DEPARTMENT	15 NEWMARKET RD	DURHAM	UIC	10359	CLOSED	3	8		-70.919255	43.133058
1133	Point	1382	199312048	DURHAM PUBLIC WORKS DEPARTMENT	15 NEWMARKET RD	DURHAM	UIC	10359	CLOSED	3	8		-70.919366	43.132837

NHDES Environmental Database Search Results
Underground Storage Tank Sites

FID	Shape	MASTERID	SITE_NO	FACILITY_N	FACILITY	ADDRESS	TOWN	FACILITY_T	GIS_TYPE	TANK_NO	COLL_METHO	LONGITUDE	LATITUDE
1	Point	57991	200303059	113502	UNIVERSITY OF NEW HAMPSHIRE	MAIN ST	DURHAM	STATE GOVERNMENT	UST_TANK			-70.934533	43.132134
53	Point	1395	198906040	111352	DURHAM CIRCLE K	4A DOVER RD	DURHAM	GAS STATION	UST			-70.91968	43.133234
63	Point	57991	200303059	113502	UNIVERSITY OF NEW HAMPSHIRE	MAIN ST	DURHAM	STATE GOVERNMENT	UST_TANK			-70.936293	43.135058
95	Point	57991	200303059	113502	UNIVERSITY OF NEW HAMPSHIRE	MAIN ST	DURHAM	STATE GOVERNMENT	UST			-70.934532	43.136527
112	Point	1386	198606008	112229	FIRST SAVINGS BANK	6 NEWMARKET RD	DURHAM	COMMERCIAL	UST			-70.920508	43.132275
219	Point	1380	199006011	220100	DURHAM LANDFILL	DURHAM POINT RD	DURHAM	LOCAL GOVERNMENT	UST_TANK			-70.936389	43.136523
232	Point	57991	200303059	113502	UNIVERSITY OF NEW HAMPSHIRE	MAIN ST	DURHAM	STATE GOVERNMENT	UST_TANK			-70.930547	43.133104
262	Point	1375	199302013	220512	CONSOLIDATED COMMUNICATIONS OF NORTHERN	MCDANIEL DR	DURHAM	UTILITIES	UST TANK	3		-70.932631	43.131387
352	Point	1380	199006011	220100	DURHAM LANDFILL	DURHAM POINT RD	DURHAM	LOCAL GOVERNMENT	UST			-70.918945	43.129777
413	Point	1382	199312048	112701	DURHAM PUBLIC WORKS DEPARTMENT	15 NEWMARKET RD	DURHAM	LOCAL GOVERNMENT	UST			-70.919371	43.132883
415	Point	57991	200303059	113502	UNIVERSITY OF NEW HAMPSHIRE	MAIN ST	DURHAM	STATE GOVERNMENT	UST_TANK			-70.933841	43.133076
434	Point	1375	199302013	220512	CONSOLIDATED COMMUNICATIONS OF NORTHERN	MCDANIEL DR	DURHAM	UTILITIES	UST			-70.932599	43.131222

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Mill Pond Dam Feasibility Study | Durham, New Hampshire

Source : NHDES, VHB, ArcGIS Online

NHDES Environmental Database Search Results - EMD Sediment Quality Sample Locations

Sediment Sampling and Analysis Plan

Appendix B:
2009 Sediment Sampling Analytical Results

TABLE 2.0 SEDIMENT SAMPLING ANALYTICAL RESULTS - MILL POND /OYSTER RIVER - DURHAM, NEW HAMPSHIRE

SAMPLE ANALYSIS COMPOUND	**SED1** 0'-4' 10/30/09	**SED2** 0'-4' 10/30/09	**SED3** 0'-4' 10/30/09	**SED4** 0'-4' 10/30/09	**SED5** 0'-2' 10/30/09	**SED6** 0'-2' 10/30/09	**SED7** 0'-3' 10/30/09	**SED8** 0'-2.5' 10/30/09	**SED9** 0'-1.5' 10/30/09	**SED10a** 0'-1.5' 11/01/09	**SED10b** 0'-1.5' 11/01/09 DUP	**SED11a** 0'-3' 11/01/09	**SED11b** 0'-3' 11/01/09 DUP	**SED12** 0'-1.5' 11/01/09 COMP	**FreshWater ARCS PEL (5)**	**Freshwater Ecosystems TECs (6)**	**Marine Ecotox ERL (5)**
SIEVE - GRAIN DESCRIPTION	1% G, 54% S, 45%S/C	0% G 13% S 87%S/C	0.2% G 43% S 57%S/C	0% G 10% S 90%S/C	NA	0% G 3% S 97%S/C	(0-2') 0.7% G 29% S 70%S/C (2-3') 0.5% G 22% S 77%S/C	1% G 24% S 75%S/C	0.5% G 12% S 88%S/C	0.1 % G 39% S 69%S/C	NA	0 % G 10 % S 90%S/C	NA	35 % G 30 % S 35%S/C	--	--	--
DETECTED VOCS **(Method 8260B)**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	--	--	--
DETECTED PAHs **(Method 8270C)** (ug/Kg)	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
Phenanthrene	< 640	**847**	**463**	**1100**	<800	<1000	**463**	**623**	<860	**630**	**508**	<670	<680	<990	515	204	240
Fluoranthene	<640	**1530**	**774**	2210	<800	**1220**	**774**	**1090**	<860	**1240**	**982**	<670	<680	<990	2355	423	600
Pyrene	<640	**1330**	**730**	**1970**	<800	**1100**	**730**	**1060**	<860	**1140**	**901**	<670	<680	<990	875	195	665
Benzo(a)Anthracene	<640	**583**	<740	**910**	<800	<1000	<740	**434**	<860	<990	<890	<670	<680	<990	385	108	261
Chrysene	<640	**798**	**451**	**1140**	<800	**668**	**451**	**593**	<860	**673**	**546**	<670	<680	<990	862	166	384
Benzo(b)Fluoranthene	<640	1060	658	1540	<800	945	658	809	<860	983	809	<670	<680	<990	NS	NS	NS
Benzo(k)Fluoranthene	<640	<799	<740	434	<800	<1000	<740	<810	<860	<990	<890	<670	<680	<990	NS	NS	NS
Benzo(a)Pyrene	<640	661	<740	**992**	<800	616	<740	516	<860	594	<890	<670	<680	<990	782	NS	763
Indeno(1,2,4-cd)Pyrene	<640	698	532	901	<800	806	532	659	<860	767	665	<670	<680	<990	NS	NS	NS
RCRA METALS (mg/Kg)	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Arsenic	**12.0**	**10.4**	**9.1**	**11.4**	**12.8**	**16.1**	**11.8**	**13.5**	**12.4**	**17.6**	**15.3**	**9.1**	**9.0**	**14.6**	5.9	9.79	8.2
Barium	103	101	32	163	115	130	99	101	116	120	122	98	102	86	NS	NS	NS
Cadmium	**3.6**	**0.9**	<2.0	<0.9	<2.2	**0.8**	<2.1	<2.2	<2.4	**1.1**	**0.8**	<1.9	<1.8	<2.8	0.596	0.99	1.2
Chromium	32	**38**	11	**53**	36	**39**	37	**40**	**41**	**43**	**44**	33	33	**64**	37.3	43.4	81
Lead	**83**	**64**	6	17	**45**	**48**	21	**36**	9	**54**	**52**	17	15	14	35	35.8	46.7
Selenium	<3.4	<3.7	<2.0	<5.9	<4.4	<5.5	<4.2	<4.4	<4.8	<5.4	<5.0	<3.9	<3.7	<5.6	NS	NS	NS
Silver	<1.7	<1.9	<2.0	<2.9	<2.2	<2.7	<2.1	<2.2	<2.42	<2.7	<2.5	<1.9	<1.8	<2.8	NS	NS	1.0
Mercury	<0.09	<0.09	0.14	**0.29**	**0.35**	**0.49**	**0.53**	**0.92**	0.07	**0.86**	**1.0**	**0.19**	**0.18**	0.14	0.14	0.18	0.15
PEST/PCBS Method 246/8081 (mg/Kg)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--

Notes:

1 < 110 = less than Laboratory Reporting Limit
2. Bold value = indicates exceedance of one of the Ecological Screening Level Criteria
3. NA = not analyzed NS = No Ecological Screening Level; ND = No compound detected above compound associated Laboratory Reporting Limit
4. Ecological Screening Level Data - NOAA Screening Quick Reference Table NOAA OR&R 08-01
6. Consensus Threshold Effect Concentration (TEC) - D.D. MacDonald - Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems (Arch. Environ. Contam. Toxicol. 39-20 -2000). Samples were collected and data summary was provided by HYDROTERRA Environmental Services, LLC

Appendix C:
2019 UNH Study Report Appendix

Appendix: Data tables for mercury content and loss on ignition

Table A-1. Mercury content over depth as determined by the *Milestone DMA-80* Direct Mercury Analyzer. Each value represents the average content of two (or more) duplicates.

Sawyer Mill Core-94			Sawyer Mill Core-100			Mill Pond Core-125			Mill Pond Core-127		
Depth (cm)	Mercury (ppb)	+/-	Depth (cm)	Mercury (ppb)	+/-	Depth (cm)	Mercury (ppb)	+/-	Depth (cm)	Mercury (ppb)	+/-
0	83.35	4.326	0	5.888	0.995	0	423.9	19.57	0	433.7	4.085
10	79.85	2.608	5	10.49	2.927	5	454.7	36.03	5	549.3	39.97
15	87.46	5.796	6	20.86	0.753	10	596	22.94	10	867.1	17.91
20	104.8	5.187	10	5.638	0.959	15	549.1	19.8	15	1217	20.26
30	92.15	3.933	15	5.292	1.975	20	330.4	1.673	20	3824	10.77
40	50.28	2.031	20	72.36	4.962	25	474.3	16.16	25	2975	107.1
50	22.81	0.619	25	15.26	0.685	30	463.5	41.06	30	2483	36.76
60	18.09	1.397	30	21.17	1.825	35	723.6	58.15	35	1457	20.58
						40	1344	41.71	40	380.7	4.036
						45	2688	34.27	45	79.67	0.165
						50	1882	107.2	50	56.92	10.76
						55	457.4	18.19	55	42.89	2.866
						60	37.91	3.397	60	81.31	1.564
						65	31.46	1.07	65	29.69	0.768
						69	20.22	0.097			

Table A-2. Loss on ignition, reported on fractional mass basis, of oven-dried surficial samples collected with a Van-Veen grab sampler.

Sawyer Mill Grab Samples		Mill Pond Grab Samples	
Sample ID	Loss on Ignition	Sample ID	Loss on Ignition
SM-GS-96	0.137	MP-GS-113	0.116
SM-GS-98	0.203	MP-GS-114	0.137
SM-GS-99	0.010	MP-GS-115	0.178
SM-GS-102	0.095	MP-GS-116	0.149
SM-GS-103	0.101	MP-GS-117	0.176
SM-GS-104	0.185	MP-GS-118	0.132
SM-GS-105	0.156	MP-GS-119	0.314
SM-GS-106	0.140	MP-GS-120	0.218
SM-GS-107	0.142	MP-GS-121	0.093
SM-GS-108	0.134	MP-GS-122	0.258
SM-GS-109	0.233	MP-GS-123	0.140
SM-GS-110	0.185		
SM-GS-111	0.158		

Appendix D:
Sediment Sampling Field Form

Date: **Notes Taken By:**

Place:

Project No.: **Re:**

Field Sampling Data Sheet

General Information:

Date and Time:	VHB Project #:
Location (Town/City):	Project Name:
Field Sampler:	Project Manager:
Photo #(s) and Direction:	

Weather Conditions:

Current Weather and Temperature:
Weather within previous 72 hrs:

Sample Information:

Sample ID #:
Sample Location (GPS Coordinates or field ties):
Water Depth:
Probing Depth:

Sediment Type:
Sediment Description:
Sample Type (composite, grab, etc.):
Approx. Length of Sediment Core:
Depth of penetration of the core into the sediment / amount of sediment recovery:

Additional Comments / Observations:

Appendix E:
Laboratory Reporting Limits

Summary of Laboratory Quantitation Limits
Absolute Resource Associates
Portsmouth, New Hampshire

TestGroupName	Analyte	CAS	MDL	LOD	RDL	Units	Method	Prep
PAHs in solid by 8270	naphthalene	91-20-3	0.39	0.50	0.50	ug/g	SW8270E	SW3550C
PAHs in solid by 8270	2-methylnaphthalene	91-57-6	0.10	0.30	0.50	ug/g	SW8270E	SW3550C
PAHs in solid by 8270	acenaphthylene	208-96-8	0.27	0.30	0.50	ug/g	SW8270E	SW3550C
PAHs in solid by 8270	acenaphthene	83-32-9	0.26	0.30	0.50	ug/g	SW8270E	SW3550C
PAHs in solid by 8270	dibenzofuran	132-64-9	0.45	0.50	0.50	ug/g	SW8270E	SW3550C
PAHs in solid by 8270	fluorene	86-73-7	0.28	0.30	0.50	ug/g	SW8270E	SW3550C
PAHs in solid by 8270	phenanthrene	85-01-8	0.22	0.30	0.50	ug/g	SW8270E	SW3550C
PAHs in solid by 8270	anthracene	120-12-7	0.23	0.30	0.50	ug/g	SW8270E	SW3550C
PAHs in solid by 8270	fluoranthene	206-44-0	0.49	0.50	0.50	ug/g	SW8270E	SW3550C
PAHs in solid by 8270	pyrene	129-00-0	0.37	0.40	0.50	ug/g	SW8270E	SW3550C
PAHs in solid by 8270	benzo(a)anthracene	56-55-3	0.27	0.30	0.50	ug/g	SW8270E	SW3550C
PAHs in solid by 8270	chrysene	218-01-9	0.30	0.30	0.40	ug/g	SW8270E	SW3550C
PAHs in solid by 8270	benzo(b)fluoranthene	205-99-2	0.10	0.30	0.50	ug/g	SW8270E	SW3550C
PAHs in solid by 8270	benzo(k)fluoranthene	207-08-9	0.29	0.40	0.50	ug/g	SW8270E	SW3550C
PAHs in solid by 8270	benzo(a)pyrene	50-32-8	0.27	0.30	0.40	ug/g	SW8270E	SW3550C
PAHs in solid by 8270	indeno(1,2,3-cd)pyrene	193-39-5	0.39	0.40	0.50	ug/g	SW8270E	SW3550C
PAHs in solid by 8270	dibenzo(a,h)anthracene	53-70-3	0.27	0.30	0.40	ug/g	SW8270E	SW3550C
PAHs in solid by 8270	benzo(g,h,i)perylene	191-24-2	0.10	0.30	0.50	ug/g	SW8270E	SW3550C
PCBs in soil by 8082	PCB-1016	12674-11-2	0.018	0.040	0.17	ug/g	SW8082A	SW3546
PCBs in soil by 8082	PCB-1221	11104-28-2	0.018	0.040	0.17	ug/g	SW8082A	SW3546
PCBs in soil by 8082	PCB-1232	11141-16-5	0.018	0.040	0.17	ug/g	SW8082A	SW3546
PCBs in soil by 8082	PCB-1242	53469-21-9	0.018	0.040	0.17	ug/g	SW8082A	SW3546
PCBs in soil by 8082	PCB-1248	12672-29-6	0.018	0.040	0.17	ug/g	SW8082A	SW3546
PCBs in soil by 8082	PCB-1254	11097-69-1	0.018	0.040	0.17	ug/g	SW8082A	SW3546
PCBs in soil by 8082	PCB-1260	11096-82-5	0.018	0.040	0.17	ug/g	SW8082A	SW3546
Pesticides in soil by 8081	alpha-BHC	319-84-6	0.0030	0.030	0.040	ug/g	SW8081B	SW3546
Pesticides in soil by 8081	beta-BHC	319-85-7	0.0040	0.030	0.040	ug/g	SW8081B	SW3546
Pesticides in soil by 8081	delta-BHC	319-86-8	0.0040	0.030	0.040	ug/g	SW8081B	SW3546
Pesticides in soil by 8081	gamma-BHC (Lindane)	58-89-9	0.0040	0.030	0.040	ug/g	SW8081B	SW3546
Pesticides in soil by 8081	Heptachlor	76-44-8	0.0040	0.030	0.040	ug/g	SW8081B	SW3546
Pesticides in soil by 8081	Aldrin	309-00-2	0.0050	0.030	0.040	ug/g	SW8081B	SW3546
Pesticides in soil by 8081	Heptachlor Epoxide	1024-57-3	0.0070	0.030	0.040	ug/g	SW8081B	SW3546
Pesticides in soil by 8081	Endosulfan I	959-98-8	0.0050	0.030	0.040	ug/g	SW8081B	SW3546
Pesticides in soil by 8081	Dieldrin	60-57-1	0.0050	0.030	0.040	ug/g	SW8081B	SW3546
Pesticides in soil by 8081	4,4'-DDE	72-55-9	0.0070	0.030	0.040	ug/g	SW8081B	SW3546
Pesticides in soil by 8081	Endrin	72-20-8	0.0070	0.030	0.040	ug/g	SW8081B	SW3546
Pesticides in soil by 8081	Endosulfan II	33213-65-9	0.0060	0.030	0.040	ug/g	SW8081B	SW3546
Pesticides in soil by 8081	4,4'-DDD	72-54-8	0.0060	0.030	0.040	ug/g	SW8081B	SW3546
Pesticides in soil by 8081	Endosulfan Sulfate	1031-07-8	0.0030	0.030	0.040	ug/g	SW8081B	SW3546
Pesticides in soil by 8081	4,4'-DDT	50-29-3	0.0060	0.030	0.040	ug/g	SW8081B	SW3546
Pesticides in soil by 8081	Methoxychlor	72-43-5	0.011	0.030	0.040	ug/g	SW8081B	SW3546
Pesticides in soil by 8081	Endrin Ketone	53494-70-5	0.0070	0.030	0.040	ug/g	SW8081B	SW3546
Pesticides in soil by 8081	Endrin Aldehyde	7421-93-4	0.015	0.030	0.040	ug/g	SW8081B	SW3546
Pesticides in soil by 8081	alpha-Chlordane	5103-71-9	0.0050	0.030	0.040	ug/g	SW8081B	SW3546
Pesticides in soil by 8081	gamma-Chlordane	5103-74-2	0.0050	0.030	0.040	ug/g	SW8081B	SW3546
Pesticides in soil by 8081	Toxaphene	8001-35-2	0.040	0.20	0.20	ug/g	SW8081B	SW3546

Summary of Laboratory Quantitation Limits
Absolute Resource Associates
Portsmouth, New Hampshire

TestGroupName	Analyte	CAS	MDL	LOD	RDL	Units	Method	Prep
Arsenic in solids by 6020	Arsenic	7440-38-2	0.097	0.50	2.5	ug/g	SW6020A	SW3051A
Barium in solids by 6020	Barium	7440-39-3	0.13	0.50	5.0	ug/g	SW6020A	SW3051A
Cadmium in solids by 6020	Cadmium	7440-43-9	0.0064	0.050	0.50	ug/g	SW6020A	SW3051A
Chromium in solids by 6020	Chromium	7440-47-3	0.020	0.50	5.0	ug/g	SW6020A	SW3051A
Lead in solids by 6020	Lead	7439-92-1	0.27	0.50	2.5	ug/g	SW6020A	SW3051A
Mercury in solids by 7471	Mercury	7439-97-6	0.033	0.080	0.14	ug/g	SW7471B	TOTAL
Selenium in solids by 6020	Selenium	7782-49-2	0.17	0.50	5.0	ug/g	SW6020A	SW3051A
Silver in solids by 6020	Silver	7440-22-4	0.0055	0.25	2.5	ug/g	SW6020A	SW3051A

Appendix F:
Screening Level Ecological Reference Values

Screening Quick Reference Tables

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This set of NOAA Screening Quick Reference Tables, or SQuiRTs, presents screening concentrations for inorganic and organic contaminants in various environmental media. Additional reference material, such as guidelines for sample preservation, are also included.

NOAA identifies potential impacts to coastal resources and habitats likely to be affected by hazardous wastes. To screen for substances which may threaten natural resources of concern to NOAA, environmental concentrations are compared to these screening levels. These tables are intended for preliminary screening purposes only: they do not represent official NOAA policy and do not constitute criteria or clean-up levels. NOAA does not endorse their use for any other purposes. Screening levels are reported with the number of significant figures they were originally reported with.

In this new version, column headings link to OR&R's web site wherebrief descriptions of the benchmark may be found. However, detailed guidance on the recommended application of various screening guidelines is provided in the original sources (listed in each SQuiRT section, with web links for many). Users of the SQuiRT cards are strongly encouraged to review supporting documentation to determine appropriateness for their specific use.

The SQuiRT card set has been re-organized from earlier versions to accommodate expansion. Benchmarks from numerous new sources have been incorporated, and the list of analytes vastly increased. The SQuiRT cards present benchmarks representing different degrees of protectiveness. Multiple benchmarks are also provided in many cases: the user is advised to review the derivation of any particular benchmark before selecting a specific value. Information is still presented in sections, with *new sections* appearing in this expanded version:

- Inorganics in Sediment (freshwater and marine)
- Inorganics in Water (groundwater and surface water)
- Organics in Water and Soil
- *Toxic Equivalency Factors*
- Guidelines for Sample Collection & Storage
- Analytical Methods for Inorganics
- Inorganics in Soil
- Organics in Sediment
- *PCB Composition*
- *Composition by Carbon Range*
- Analytical Methods for Organics

Footnotes within each SQuiRT section which appear at the bottom of the page are only to aid in deciphering the nature of specific entries. Due to space constraints, notations which relate to the source for individual values are explained at the end of the section. Organic chemicals are now listed alphabetically, without categorization. A few synonyms are provided, but CAS numbers are also presented to aid in identifying and finding specific analytes. Except as noted, all concentrations in the SQuiRT cards are in parts per billion.

For surface water samples, because releases from hazardous waste sites are often continuous and long-term, concentrations are most often compared directly with chronic benchmarks, when available. Groundwater concentrations are also screened against chronic benchmarks. However, suitable site-specific dilution factors should be applied to allow for dilution upon migration and discharge of groundwater to surface water. The SQuiRT cards present U.S. Environmental Protection Agency (EPA) Maximum Contaminant Levels (MCLs), applicable to drinking water sources and secondary MCLs applicable to groundwater, supplemented by values from Canada and the United Nations World Health Organization.

Preference for surface water and groundwater benchmarks is given to U.S. EPA Ambient Water Quality Criteria (AWQC). This is generally followed by Tier II Secondary Acute Values (SAVs) or available standards and guidelines from other regulatory agencies. Tier II SAVs are derived using a similar approach to AWQC, but do not have sufficient supporting data for full criteria calculation. Lowest Observable Effect Levels (LOELs) were originally published by EPA with AWQC. Around 2000, EPA stopped publishing these values, however, LOELs are reproduced here when no other benchmark is available, because in many instances, they formed the basis for state standards.

For many trace elements, AWQC are now expressed in terms of the "dissolved" fraction, which is essentially defined operationally as a filtered fraction. Likewise, the toxicity of many trace elements is related to the water hardness, and the values presented are for a default hardness of 100 mg/L $CaCO_3$. Equations are provided in the SQuiRT cards to calculate the exact criteria for a given hardness, or, to convert from unfiltered, total concentrations to "dissolved" fractions.

Screening Quick Reference Table for Inorganics in Sediment

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Analyte All concentrations in parts per billion dry weight unless specified otherwise		FRESHWATER SEDIMENT									MARINE SEDIMENT						
		"Background"[1]	ARCS *H. azteca* TEL[2]	TEC[3]	TEL[3]	LEL[4]	PEC[3]	PEL[3]	SEL[4]	UET[1]	T_{20}[5]	TEL[6]	ERL[6]	T_{50}[5]	PEL[6]	ERM[6]	AET[7]
Predicted Toxicity Gradient:							Increasing →							Increasing →			
Aluminum (%)	Al	0.26%	2.55%														1.8% N
Antimony	Sb	160								3,000 M	630			2,400			9,300 E
Arsenic	As	1,100	10,798	9,790	5,900	6,000	33,000	17,000	33,000	17,000 I	7,400	7,240	8,200	20,000	41,600	70,000	35,000 B
Barium	Ba	700										130,100#					48,000 A
Cadmium	Cd	100-300	583	990	596	600	4,980	3,530	10,000	3,000 I	380	680	1,200	1,400	4,210	9,600	3,000 N
Chromium	Cr	7,000-13,000	36,286	43,400	37,300	26,000	111,000	90,000	110,000	95,000 H	49,000	52,300	81,000	141,000	160,000	370,000	62,000 N
Cobalt	Co	10,000				50,000+											10,000 N
Copper	Cu	10,000-25,000	28,012	31,600	35,700	16,000	149,000	197,000	110,000	86,000 I	32,000	18,700	34,000	94,000	108,000	270,000	390,000 MO
Iron (%)	Fe	0.99-1.8 %	18.84%			2%			4%	4% I							22% N
Lead	Pb	4,000-17,000	37,000	35,800	35,000	31,000	128,000	91,300	250,000	127,000 H	30,000	30,240	46,700	94,000	112,000	218,000	400,000 B
Manganese	Mn	400,000	630,000			460,000			1,100,000	1,100,000 I							260,000 N
Mercury	Hg	4-51		180	174	200	1,060	486	2,000	560 M	140	130	150	480	700	710	410 M
Nickel	Ni	9,900	19,514	22,700	18,000	16,000	48,600	36,000	75,000	43,000 H	15,000	15,900	20,900	47,000	42,800	51,600	110,000 EL
Selenium	Se	290															1,000 A
Silver	Ag	<500				500 +				4,500 H	230	730	1,000	1,100	1,770	3,700	3,100 B
Strontium	Sr	49,000															
Tin	Sn	5,000										48 *					> 3,400 N
Vanadium	V	50,000															57,000 N
Zinc	Zn	7,000-38,000	98,000	121,000	123,000	120,000	459,000	315,000	820,000	520,000 M	94,000	124,000	150,000	245,000	271,000	410,000	410,000 I
Lead 210 $^{bq}/_{g}$ dw						0.5 ^			< 9.7 ^								
Polonium 210 $^{bq}/_{g}$ dw						0.6 ^			< 8.7 ^								
Radium 226 $^{bq}/_{g}$ dw						0.1 ^			< 13 ^								
Sulfides										130,000 M							4,500 MO

\# - Based on SLC approach using sensitive species HC5%; ES&T 2005 39(14):5148-5156.
* - Based upon EQp approach using current AWQC CCC
^ - Based on SLC approach to derive LEL and SEL; Env'al Monitor & Ass'ment 2005 110:71-85
\+ - Carried over from Open Water disposal Guidelines; treated as if LEL for management decisions.

Bioassay endpoints: M – Microtox; B – Bivalve; E – Echinoderm larvae; O – Oyster larvae;
A – Amphipod; N – Neanthes; L –Larval bioassay; plus, I – Infaunal community impacts

Sources

1 – Buchman, M. 1999. NOAA HAZMAT Report 99-1.
2 – EPA 905-R96-008
3 – Arch ET&C 2000, 39(1)20- TEL and PEL are also known as Canadian ISQGs and PELs
4 – Guidelines for the protection and management of aquatic sediment quality in Ontario Aug 1993
5 – ET&C 2002, 21(9)1993-
6 – Ecotox. 1996, 5(4):253-
7 – Chapter 173-204 WAC, 1991/95 as supplemented by WA Dept of Ecology staff with unpublished data.

Screening Quick Reference Table for Inorganics in Soil

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ANALYTE All concentrations in parts per billion dry weight unless specified otherwise		CAS Number	BACKGROUND[1]		DUTCH STANDARDS[2]		Eco-SSL[3]				Microbes[4]
			Mean	Range	Target	Intervention	Avian	Inverts	Mammals	Plants	
Aluminum	Al	7429905	4.70%	0.5- >10%						50,000 a	600,000
Antimony	Sb	7440360	480	bd-8,800	3,000	15,000		78,000	142 v	5,000 a	
Arsenic	As	7440382	5,200	bd-97,000	900 L	55,000	43,000	60,000 a	5,700 v	18,000	100,000
Barium	Ba	7440393	440,000	10,000-0.5%	160,000	625,000		330,000	1,040 v	500,000 a	3,000,000
Beryllium	Be	7440417	630	bd-15,000	1,100	30,000 S		40,000	1,060 v	10,000 a	
Boron	B	7440428	26,000	bd-300,000						500 a	20,000
Bromine	Br	7726956	560	bd-11,000	20,000					10,000 a	
Cadmium	Cd	7440439			800	12,000	770	20,000 a	2.22 v	4,000 a	20,000
Chromium III	Cr	7440473	< 37,000	1,000-0.2%	< 380 L	< 220,000 L	26,000	<400 a	34,000	< 1,000 a	< 10,000
Chromium VI	Cr	18540299	< 37,000		< 380 L	< 220,000 L		400 a	81,000	< 1,000 a	< 10,000
Cobalt	Co	7440484	6,700	bd-70,000	2,400 L	180,000 L	120,000		140 v	13,000	1,000,000
Copper	Cu	7440508	17,000	bd-700,000	3,400 L	96,000 L	28,000	50,000 a	5,400 v	70,000	100,000
Cyanide (total complex)	CN	57125			5,000	50,000 (pH>5)			1,330 v		
Cyanide (total free)	CN				1,000	20,000					
Fluorine	F	7782414	210,000	bd-0.37%	500,000					200,000 a	30,000
Iodine	I	7553562	750	bd-9,600						4,000 a	
Iron	Fe	7439896	1.80%	0.01- >10%							200,000
Lanthanum	La	7439910	30,000	bd-200,000							50,000
Lead	Pb	7439921	16,000	bd-700,000	55,000 L	530,000	11,000	500,000 a	53.7 v	50,000 a	900,000
Lithium	Li	7439932	20,000	bd-140,000						2,000 a	10,000
Manganese	Mn	7439965	330,000	bd-0.7%			4,300,000	450,000	4,000,000	220,000	100,000
Mercury	Hg	7439976	58	bd-4,600	300	10,000		100 a v		300 a	30,000
Mercury(methyl)		22967926			37 L	4,000 L		< 100 a v	1.58 v	< 300 a	
Molybdenum	Mo	7439987	590	bd-15,000	3,000	190,000 L				2,000 a	200,000
Nickel	Ni	7440020	13,000	bd-700,000	260 L	100,000 L	210,000	200,000 a	13,600 v	30,000 a	90,000
Selenium	Se	7782492	260	bd-4,300	700 L	100,000 S	1,2000	4,100	630	520	100,000
Silver	Ag	7440224				15,000 S	4,200		4,040 v	2,000 a	50,000
Strontium	Sr	7440246	120,000	bd-0.3%							
Sulfide		18496258							3.58 v		
Sulfur	S	7704349	0.12%	bd-4.8%							
Technetium	Tc	7440268								200 a	

1: bd – below detection
2: S – serious contamination level; L – Environmental Risk Limit

Screening Quick Reference Table for Inorganics in Soil

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ANALYTE All concentrations in parts per billion dry weight unless specified otherwise		CAS Number	BACKGROUND[1]		DUTCH STANDARDS[2]		Eco-SSL[3]				Microbes[4]
			Mean	Range	Target	Intervention	Avian	Inverts	Mammals	Plants	
Tellurium	Te	13494809				600,000					
Thallium	Tl	7440280	8,600	2,20-31,000	1,000	15,000 S			56.9 v	1,000 a	
Tin	Sn	7440315	890	bd-10,000	19,000 background	900,000 S			7,620 v	50,000 a	2,000,000
Titanium	Ti	7440326	0.224 %	0.007-2 %							1,000,000
Tin as Triphenyltin		668348				< 2,500					
Tungsten	W	7440337									400,000
Uranium	U	7440611	2,300	290-11,000						5,000 a	
Vanadium	V	7440622	58,000	bd-500,000	42,000	250,000 S	7,800		1,590 v	2,000 a	20,000
Zinc	Zn	7440666	48,000	bd-0.29%	16,000 L	350,000 L	46,000	6,620 v		50,000 a	100,000

Sources

1 – USGS Prof. Paper 1270, 1984. Mean is geometric mean of national data.

2 – Entry is lower of current VROM Environmental Quality standards or the updated RIVM Environmental Risk Limits. Risk limits are typically divided by 100 to derive the Target value; this computation has not been done here.
Dutch Target/Intervention: E.M.J. Verbruggen, R. Posthumus and A.P. van Wezel, 2001. Ecotoxicological Serious Risk Concentrations for soil, sediment, and (ground)water: Updated proposal for first series of compounds. Nat. Inst. Public Health and the Env., and subsequent updates as published elsewhere.
Min. Housing, Spatial Plan. And the Env., 2000. Annexes Circular on target values and intervention values for soil remediations.

3 – Entry is lower of either:
EPA Eco-SSLs, www.epa.gov/ecotox/ecossl/
a – ORNL Screening benchmark for earthworms and soil microorganisms: ORNL 1997a, ES/ER/TM-126/R2
v – EPA R5 Eco Screening levels soil - shrew or vole, www.epa.gov/reg5rcra/ca/

4 - ORNL 1997b, ES/ER/TM-85/R3.

1: bd – below detection
2: S – serious contamination level; L – Environmental Risk Limit

Screening Quick Reference Table for Inorganics in Water

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ELEMENT All concentrations in parts per billion unless specified otherwise		GROUND WATER [1]	SURFACE WATERS [2]			
			Freshwater		Marine	
			Acute	Chronic	Acute	Chronic
Aluminum	Al	50-200 *	pH 750	pH 87		
Antimony	Sb	6	88 p	30 p	1,500 p	500 p
Arsenic III	As^{+3}	<10		190 E		2.3 NZ
Arsenic V	As^{+5}	< 10	66 T	3.1 T	2,319 *	
Arsenic, Total	As	10	340	150	69	36
Barium	Ba	2,000	110 T	3.9 E	1,000 BC	200 BC
Beryllium	Be	4	35 T	0.66 T	1,500 BC	100 BC
Boron	B	5,000 C	30 T	1.6 T		1,200
Cadmium	Cd	5	2.0 †	0.25 †	40	8.8
Chromium III	Cr^{+3}	< 100	570 †	74 †	10,300 *	27.4 NZ
Chromium VI	Cr^{+6}	< 100	16	11	1,100	50
Chromium, Total	Cr	100				
Cobalt	Co		1,500 T	3.0 E		1 NZ
Copper	Cu	1,300	13 †	9 †	4.8	3.1
Fluoride	F	4,000	200 BC (hardness < 50)		1,500 BC	
Gallium	Ga			18 NZ		use 18 NZ
Iron	Fe	300 *		1,000	300 BC	50 BC
Lanthium	La			0.04 NZ		
Lead	Pb	15	65 †	2.5 †	210	8.1
Lithium	Li		260 T	14 T		
Manganese	Mn	50 *	2,300 T	80 E		100 BC
Mercury	Hg	2	1.4	0.77	1.8	0.94
Methyl Mercury			0.099 T	0.0028 T		
Molybdenum	Mo	70 W	16,000 T	34 NZ		23 NZ
Nickel	Ni	20 W	470 †	52 †	74	8.2
Phosphorus	P					0.1
Potassium	K		373,000 BC			
Selenium	Se	50	13-186 total	5 total	290	71
Silver	Ag	100 *	1.6 (½) †	0.36 T	0.95 (½)	
Strontium	Sr		15,000 T	1,500 T		
Thallium	Tl	2	110 T	0.03 NZ	2,130 *	17 NZ
Tin as TBT			0.46	0.072	0.42	0.0074

1: * – Secondary standard

2: pH – criteria is pH dependent ; p - proposed; † - hardness dependent; * - EPA LOEL ; (½) - CMC is halved to compare to 1985 Guideline derivation

Screening Quick Reference Table for Inorganics in Water

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ELEMENT All concentrations in parts per billion unless specified otherwise		GROUND WATER [1]	SURFACE WATERS [2]			
			Freshwater		Marine	
			Acute	Chronic	Acute	Chronic
Tin as Di-N-Butyl			0.08 BC			
Tin as Triethyl			0.4 BC			
Tin as Triphenyl			0.022 BC		34 BC	
Titanium	Ti		2,000 BC			
Uranium	U	30	46 T	0.5 NZ	500 BC	100 BC
Vanadium	V		280 T	19 E		50 BC
Zinc (Zn)	Zn	5,000 *	120 †	120 †	90	81
Zirconium	Zr		310 T	17 T		
Hydrogen Sulfide			2		2	
Cyanide, free	CN	200	22	5.2	1	1

Freshwater criterion for certain elements (†) are expressed as a function of hardness (mg/L) in the water column. The values shown assume 100 mg/L. Values for a different hardness may be calculated using the following equations to arrive at a CMC or CCC for *filtered* samples. Hardness may range up to 400 mg/L as calcium carbonate. For hardness above this range, use 400 mg/L as the maximum value allowed.

For salinity between 1 and 10 ppt, use the more stringent of either fresh or marine values.

Sources

1 – Primary entry is the US EPA MCL value, followed by the WHO drinking water guidelines.
Maximum Contaminant Levels (MCLs): http://www.epa.gov/safewater/index.html
W – World Health Organization's (WHO) Drinking water guidelines: http://www.who.int/water_sanitation_health/dwq/en/
C – Canadian water Quality Guidelines: http://www.ec.gc.ca/CEQG-RCQE/English/Ceqg/Water/default.cfm

2 – Primary entry is the US Ambient Water Quality Criteria, followed by the lowest of Tier II SAVs or available standards and guidelines.
EPA Ambient water Quality Criteria (AWQC): http://www.epa.gov/waterscience/criteria/aqlife.html
T – Tier II Secondary Acute Value: http://www.esd.ornl.gov/programs/ecorisk/tools.html
BC – British Columbia Water Quality Guidelines (either working or recommended): http://www.env.gov.bc.ca/wat/wq/
NZ – Australian & New Zealand ECLs and Trigger values: ANZECC Oct 2000, Volume 1, The Guidelines. www.mfe.govt.nz/publications/
E – EcoUpdate: www.epa.gov/oswer/riskassessment/ecoup/

Lowest Observable Effect Levels (LOELs) previously published by EPA are also included since these essentially were the basis for many state standards.
EPA LOELs: EPA Water quality Criteria Summary, Office of Science & Technology, Health & Ecological Criteria Div., Ecological Risk Assessment Branch, 1991.
Full listings appeared in various Fed. Register notices and in EPA's Quality Criteria for Water, 1992.

1: * – Secondary standard
2: pH – criteria is pH dependent ; p - proposed; † - hardness dependent; * - EPA LOEL ; (½) - CMC is halved to compare to 1985 Guideline derivation

Screening Quick Reference Table for Inorganics in Water

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ELEMENT	HARDNESS CALCULATIONS – UNFILTERED FRESHWATER CRITERIA		UNFILTERED TO FILTERED CALCULATIONS		
	CMC	CCC	Fresh water CMC	Freshwater CCC	Marine CMC / CCC
Arsenic (As)			1	1	1
Cadmium (Cd)	$CMC = e^{1.0166 [\mathit{ln}(\text{hardness})] - 3.924}$	$CCC = e^{0.7409 [\mathit{ln}(\text{hardness})] - 4.719}$	CF = 1.136672 - 0.041838 [*ln*(hardness)]	CF = 1.101672 - 0.041838 [*ln*(hardness)]	CF = 0.994
Chromium III (Cr+3)	$CMC = e^{0.819 [\mathit{ln}(\text{hardness})] + 3.7256}$	$CCC = e^{0.819 [\mathit{ln}(\text{hardness})] + 0.6848}$	CF = 0.316	CF = 0.860	–
Chromium VI (Cr +6)			CF = 0.982	CF = 0.962	CF = 0.993
Copper (Cu)	$CMC = e^{0.9422 [\mathit{ln}(\text{hardness})] - 1.7}$	$CCC = e^{0.8545 [\mathit{ln}(\text{hardness})] - 1.702}$	CF = 0.960	CF = 0.960	CF = 0.83
Lead (Pb)	$CMC = e^{1.273 [\mathit{ln}(\text{hardness})] - 1.46}$	$CCC = e^{1.273 [\mathit{ln}(\text{hardness})] - 4.705}$	CF = 1.46203 - 0.145712 [*ln*(hardness)]	SAME AS CMC	CF = 0.951
Mercury (Hg)			CF = 0.85	CF = 0.85	CF = 0.85
Nickel (Ni)	$CMC = e^{0.846 [\mathit{ln}(\text{hardness})] + 2.255}$	$CCC = e^{0.846 [\mathit{ln}(\text{hardness})] + 0.0584}$	CF = 0.998	CF = 0.997	CF = 0.990
Selenium (Se)			–	–	CF = 0.998
Silver (Ag)	$CMC = e^{1.72 [\mathit{ln}(\text{hardness})] - 6.52}$	CCC — No criteria	CF = 0.85	–	CF = 0.85 / –
Zinc (Zn)	$CMC = e^{0.8473 [\mathit{ln}(\text{hardness})] + 0.884}$	$CCC = e^{0.8473 [\mathit{ln}(\text{hardness}) +0.884}$	CF = 0.978	CF = 0.986	CF = 0.946

Freshwater criterion for certain elements are expressed as a function of hardness (mg/L) in the water column. The values shown assume 100 mg/L. Values for a different hardness may be calculated using the above equations to arrive at a CMC or CCC for *filtered* samples. Hardness may range up to 400 mg/L as calcium carbonate. For hardness above this range, use 400 mg/L as the maximum value allowed.

Criteria for most metals are expressed as standards for samples filtered through 0.45 m filter (*i.e.*, "dissolved"). To convert unfiltered concentrations to filtered, multiply the unfiltered concentration value by the appropriate Conversion Factor (CF) above. For cadmium and lead, the conversion factor itself is hardness-dependent.

CMC: Criteria Maximum Concentration is the highest level for a 1-hour average exposure not to be exceeded more than once every three years, and is synonymous with "acute."

CCC: for a 4-day average exposure not to be exceeded more than once every three years, and is synonymous with "chronic."

Sources

EPA Ambient water Quality Criteria (AWQC): http://www.epa.gov/waterscience/criteria/aqlife.html

Screening Quick Reference Tables for Organics – Sediment

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ANALYTE	CAS Number	FRESHWATER SEDIMENT								DUTCH Sediment[5]		MARINE SEDIMENT							Eco Tox EqP[9] @1%TOC
All concentrations in parts per billion dry weight unless specified otherwise		ARCS *Hyalella* TEL[1]	TEL[2]	TEC[2]	LEL[3]	PEL[2]	PEC[2]	SEL[3]	UET[4] @1%TOC	Target	Intervention	T_{20}[6]	TEL[7]	ERL[7]	T_{50}[6]	PEL[7]	ERM[7]	AET[8]	
2,3,7,8-TCDD dioxin TEQs	1746016		0.00085 c			0.0215 c			0.0088†H		1 S		0.00085 c			0.0215 c		0.0036 N	
Acenaphthene	83329		6.71 c			88.9 c			290 M			19	6.71	16	116	88.9	500	130 E	
Acenaphthylene	208968		5.87 c			128 c			160 M			14	5.87	44	140	128	640	71 E	
Acrylonitrile	107131									0.07	100 S								
Aldrin	309002				2			80	40 I	0.06	1,700 LB							9.5 AE	
Aldrin + Dieldrin + Endrin	na									5	140 L								
Anthracene	120127	10	46.9 c	57.2	220	245 c	845	3,700	260 M	39 LB	1,600 LB	34	46.9	85.3	290	245	1,100	280 E	
Atrazine	1912249									0.2	710 LB								
BCH compounds (sum)	na									10	6,400 L								
Benz[a]anthracene	56553	15.72	31.7	108	320	385	1,050	14,800	500 I	25 L	2,500 L	61	74.8	261	466	693	1,600	960 E	
Benzene	71432									10	1,000								57
Benzo(ghi)perylene	191242				170			3,200	300 M	570 LB	33,000 LB	67			497			670 M	
Benzo[a]pyrene	50328	32.4	31.9	150	370	782	1,450	14,400	700 I	52 L	7,000 L	69	88.8	430	520	763	1,600	1,100 E	
Benzo[b]fluoranthene	205992											130			1,107			1,800 E I	
Benzo[k]fluoranthene	207089	27.2			240			13,400	13,400B	380 LB	38,000 LB	70			537			1,800 E I	
Benzoic acid	65850																	65 O	
Benzyl alcohol	100516																	52 B	
BHC, alpha (α-HCH)	319846				6			100		3	< 2,000								
BHC, beta (β-HCH)	319857				5			210		9	< 2,000								
BHC, delta (δ-HCH)	319868									< 10	< 2,000								
BHC, gamma- (γ-HCH; Lindane)	58899		0.94	2.37	3	1.38	4.99	10	9 I	0.05	1,200 L		0.32			0.99		> 4.8 N	3.7
Biphenyl	92524											17			73				1,100
Bis(2-ethylhexyl)phthalate (DEHP)	117817								750 †M	< 100	10,000 LB		182			2647		1,300 I	
Bromoform (Tribromomethane)	75252										75,000								650
Butanol	35296721										30,000 S								
Butyl acetate, 1- or 2-	na										200,000 S								
Butyl benzyl phthalate	85687									< 100	48,000 LB							63 M	1,100
Carbaryl	63252									0.03	450 LB								
Carbofuran	1563662									0.02	17 LB								
Carbon tetrachloride (Tetrachloromethane;Tetra)	56235									170 LB	1,000								1,200

4: Entry is lowest, reliable value among AET tests, on 1% TOC basis: I - Infaunal community impact ; M - Microtox bioassay ; H - *Hyalella azteca* bioassay ; † - value on dry weight basis.

5: S – Serious Contamination; L – Environmental Risk Limit for soil; LB – Environmental Risk Limit for soil or bedded sediment

8: Entry is lowest value among AET tests: I - Infaunal community impact ; A - Amphipod ; B - Bivalve ; M- Microtox bioassay ; O - Oyster larvae ; E - Echinoderm larvae ; L - Larval$_{max}$; or , N - *Neanthes* bioassay.

Screening Quick Reference Tables for Organics - Sediment

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		ARCS *Hyalella* TEL[1]	TEL[2]	TEC[2]	LEL[3]	PEL[2]	PEC[2]	SEL[3]	UET[4] @1%TOC	Target	Intervention	T_{20}[6]	TEL[7]	ERL[7]	T_{50}[6]	PEL[7]	ERM[7]	AET[8]	
Catechol (o-Dihydroxybenzene)	120809									3.2 LB	2,600 LB								
Chlordane	57749		4.5	3.24	7	8.9	17.6	60	30 I	0.03	4,000		2.26	0.5		4.79	6	2.8 A	
Chlordane (alpha)	5103719									< 0.03	< 4,000								
Chlordane (gamma)	5103742									< 0.03	< 4,000								
Chloro, 4- 2-methyl phenol	1570645										< 15,000 S								
Chloro, 4- 2-methylphenoxy acetic acid (MCPA)	94746									0.05	4,000								
Chloro, 4- 3-methyl phenol	59507										< 15,000 S								
Chloro, 4- methyl phenols	na										15,000 S								
Chloroaniline	27134265									5	50,000								
Chlorobenzenes (sum)	na									30	30,000								820
Chloroform (trichloromethane)	67663									20	10,000								
Chloronaphthalene, 1-	90131									57 LB	< 10,000								
Chloronaphthalene, 2-	91587									250 LB	< 10,000								
Chlorophenol, 2-	95578									55 LB	7,800 LB							0.333	
Chlorophenol, 3-	108430									35 L	14,000 L								
Chlorophenol, 4-	106489									20 LB	1,400 LB								
Chlorophenols (sum)	na									10	10,000								
Chrysene	218019	26.83	57.1	166	340	862	1,290	4,600	800 I	8,100 LB	35,000 LB	82	108	384	650	846	2,800	950 E	
Cresol [m-] (3-Methyl phenol)	108394									1,600 L	16,000 L								
Cresol [o-] (2-Methyl phenol)	95487									500 L	50,000 L							8 B	
Cresol [p-] (4-Methyl phenol)	106445									5.1 LB	2,600 LB							100 B	
Cresols, sum	1319773									50	5,000								
Cyclohexanone	108941									100	45,000								
DDD, 4,4- (p,p-DDD, TDE)	72548		3.54	4.88	8	8.51	28	60	< 60 I	3.9 LB	34,000 LB		1.22	2		7.81	20	< 16 I	
DDE, 4,4- (p,p-DDE)	72559		1.42	3.16	5	6.75	31.3	190	<50 I	5.8 LB	1,300 LB		2.07	2.2		374	27	< 9 I	
DDT, 4,4- (p,p-DDT)	50293		1.19 c	4.16	8	4.77 c	62.9	710	50 I	9.8 LB	1,000 L		1.19	1		4.77	7	< 12 E	
DDT+DDE+DDD (sum)	na		7	5.28	7	4,450	572	120	50 I	10	4,000		3.89	1.58		51.7	46.1	11 B	
Diazinon	333415																		1.9
Dibenz[ah]anthracene	53703	10	6.22 c	33	60	135 c		1,300	100 M			19	6.22	63.4	113	135	260	230 OM	
Dibenzofuran	132649								5,100 H									110 E	2,000

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Dichloroaniline, 2,4-	554007									< 5	< 50,000 S								
Dichloroaniline, 3,4-	95761									< 5	< 50,000 S								
Dichloroaniline, 3,4-	95761									< 5	< 50,000 S								
Dichlorobenzene, 1,2-	95501									< 30	17,000 LB							13 N	340
Dichlorobenzene, 1,3-	541731									< 30	24,000 LB								1700
Dichlorobenzene, 1,4-	106467									< 30	18,000 LB							110 IM	350
Dichlorobenzenes	25321226									< 30	19,000 LB								
Dichloroethane, 1,1-	75343									20	15,000								
Dichloroethane, 1,2-	107062									20	4,000								
Dichloroethene, 1,1- (vinylidene chloride)	75354									100	300								
Dichloroethene, 1,2- (cis or trans)	540590									200	1,000								
Dichlorophenol, 2,4-	120832									< 10	8,400 LB							0.2083	
Dichlorophenol, 2,6-	87650									< 10	57,000 LB								
Dichlorophenol, 3,4-	95772									< 10	57,000 LB								
Dichlorophenol, 3,5-	591355									< 10	5,400 LB								
Dichlorophenols (sum)	na									< 10	22,000 LB								
Dichloropropane, 1,2- (propylene dichloride)	78875									< 2	< 2,000								
Dieldrin ‡	60571		2.85	1.9	2	6.67	61.8	910	300 I	0.5	1,900 LB	0.83	0.72	0.02	2.9	4.3	8	1.9 E	
Diethyl phthalate	84662									530 L	53,000 L							6 BL	630
Diethylene-glycol	111466										270,000 S								
Dihydroxybenzenes, sum	na									62 LB	8,000 LB								
Di-iso-butyl phthalate	84695									92 LB	17,000 LB								
Dimethyl phthalate	131113									1,000 LB	84,000 LB							6 B	
Dimethylnaphthalene, 2,6-	581420											25			133				
Dimethylphenol, 2,4-	105679																	18 N	
Di-n-butyl phthalate	84742								110 H	7,000 LB	36,000 LB							58 BL	11,000
Di-n-octyl phthalate	117840									< 100	< 60,000							61 BL	
Dodecylbenzene	25155300										1,000,000 S								
Endosulfan (a or b)	115297									0.01	4,000								2.9 α 14 β

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		ARCS *Hyalella* TEL[1]	TEL[2]	TEC[2]	LEL[3]	PEL[2]	PEC[2]	SEL[3]	UET[4] @1%TOC	Target	Intervention	T_{20}[6]	TEL[7]	ERL[7]	T_{50}[6]	PEL[7]	ERM[7]	AET[8]	
Endosulfan II	33213659																		
Endrin	72208		2.67	2.22	3	62.4	207	1,300	500 I	0.04	95 L								
Ethyl acetate	141786										75,000 S								
Ethyl acetate	141786										75,000 S								
Ethyl benzene	100414									30	50,000							4 EL	3,600
Ethylene glycol	107211										100,000 S								
Fluoranthene	206440	31.46	111	423	750	2,355	2,230	10,200	1,500 M	1,000 LB	260,000	119	113	600	1,034	1,494	5,100	1,300 E	
Fluorene	86737	10	21.2 c	77.4	190	144 c	536	1,600	300 M			19	21.2	19	114	144	540	120 E	540
Formaldehyde	50000										100 S								
Guthion (Azinphos-methyl)	865000									0.005	2,000 S								
Heptachlor	76448								10 I	0.7	4,000							0.3 B	
Heptachlorepoxide	1024573		0.6	2.47	5	2.74	16	50	30 I	0.0002	4,000	0.6 c				2.74 c			
Hexachlorobenzene	118741				20			240	100 I	1.4 LB	2,000 LB							6 B	
Hexachlorobutadiene (HCBD)	87683																	1.3 E	
Hexachlorocyclohexane (BHC)	608731				3			120	100 I										
Hexachloroethane	67721																	73 BL	1,000
Hydroquinone (p-dihydroxybenzene)	123319									50	43,000 LB								
Indeno[1,2,3-cd]pyrene	193395	17.32			200			3,200	330 M	31 LB	1,900 LB	68			488			600 M	
Linar alkylbenzene sulfonates (LAS)	na												<12,800 €			>62,000 €			
Malathion	121755																		0.67
Maneb	12427382									2	22,000 L								
Methanol	67561										30,000 S								
Methoxychlor	72435																		19
Methyl ethyl ketone (MEK; 2-Butanone)	78933										35,000 S								
Methyl naphthalene, 2-	91576											21	20.2	70	128	201	670	64 E	
Methylene chloride (Dichloromethane, DCM)	75092									18 LB	3,900 L								
Methylnaphthalene, 1-	90120											21			94				
Methylphenanthrene, 1-	832699											18			112				
Methyl-tert-butyl ether (MTBE)	1634044										100,000 S								
Mirex	2385855				7			1,300	800 I										

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Monochloroaniline (3 isomers)	na									5	50,000								
Monochlorobenzenes	108907									< 30	15,000 LB								820
Monochloronaphthalenes	na									120 LB	10,000								
Monochlorophenols (sum)	na									< 10	5,400 L								
Naphthalene	91203	14.65	34.6 c	176		391 c	561		600 I	120 LB	17,000 LB	30	34.6	160	217	391	2,100	230 E	480
Nitrobenzene	98953																	21 N	
Nitrosodiphenylamine, N-	86306																	28 I	
Nonylphenol	25154523		1,400 c										1,000 c						
PAHs, Low MW	na	76.42							5,300 M	< 1,000	< 40,000		312	552		1,442	3,160	1,200 E	
PAHs, High MW	na	193							6,500 M	< 1,000	< 40,000		655	1,700		6,676	9,600	7,900 E	
PAHs, Total	na	264.1		1,610	4,000		22,800*	100,000*	12,000 M	1,000	40,000		1,684	4,022		16,770	44,792		
PCB 105	32598144									1.5 LB	< 1,000								
PCB 126	57465288									0.0025 LB	920 LB								
PCB 77	32598131									0.42 LB	< 1,00								
PCB-Aroclor 1254	na		60 c		60	340 c		340					63.3 c			709 c			
PCBs (sum)	1336363	31.62	34.1	59.8	70	277	676	5,300	26 M	0.3 LB	1,000	35	21.6	22.7	368	189	180	130 M	
Pentachloroaniline	527208										10,000 S								
Pentachlorobenzene	608935									15 LB	16,000 LB								690
Pentachlorophenol [PCP: at ph 7.8‡]	87865									< 10	8,000 LB							17 B	
Perylene	198550											74			453				
Phenanthrene	85018	18.73	41.9	204	560	515	1,170	9,500	800 I	3,300 LB	31,00 LB	68	86.7	240	455	544	1500	660 E	
Phenol	108952								48 † H	50	14,000 LB							130 E	
Phthalates (sum)	na									100	60,000								
Propanol, 2- (Isopropanol)	67630										220,000 S								
Pyrene	129000	44.27	53	195	490	875	1,520	8,500	1,000 i			125	153	665	932	1,398	2,600	2,400 E	
Pyridine	110861									100	500								
Resorcinol (m-dihydroxybenzene)	108463									34 LB	4,600 LB								
Styrene (Vinyl benzene)	100425									200 LB	86,000 LB								
Tetrachloroaniline, 2,3,5,6-	3481207										< 30,000 S								
Tetrachlorobenzene, 1,2,3,4-	634662									160 L	16,000 L								
Tetrachlorobenzene, 1,2,3,5-	634902									6.5 L	650 L								

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Screening Quick Reference Tables for Organics - Sediment

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ANALYTE All concentrations in parts per billion dry weight unless specified otherwise	CAS Number	FRESHWATER SEDIMENT								DUTCH Sediment[5]		MARINE SEDIMENT							Eco Tox EqP[9] @1%TOC
		ARCS *Hyalella* TEL[1]	TEL[2]	TEC[2]	LEL[3]	PEL[2]	PEC[2]	SEL[3]	UET[4] @1%TOC	Target	Intervention	T_{20}[6]	TEL[7]	ERL[7]	T_{50}[6]	PEL[7]	ERM[7]	AET[8]	
Tetrachlorobenzene, 1,2,4,5-	95943									10 L	1,000 L								
Tetrachlorobenzenes	na									22 L	2,200 L								
Tetrachloroethylene (Tetrachloroethene; PCE; PER)	127184									2	4,000							57 I	530
Tetrachlorophenol, 2,3,4,5-	4901513									< 10	< 10,000								
Tetrachlorophenol, 2,3,4,6-	58902									< 10	< 10,000								
Tetrachlorophenols (sum)	25167833									< 10	< 10,000								
Tetrahydrofuran	109999									100	2,000								
Tetrahydrothiophene	110010									100	8,800 LB								
Toluene	108883									10	47,000 L								670
Toxaphene	8001352		0.1 c										0.1 c						28
Tributyltinoxide	56359									< 10	< 2,500								
Trichloroaniline (multiple isomers)	na										10,000 S								
Trichloroaniline, 2,4,5-	636306										< 10,000 S								
Trichlorobenzene, 1,2,3-	87616									< 11 L	5,000 L								
Trichlorobenzene, 1,2,4-	120821									11 LB	5,100 LB							> 4.8 E	9,200
Trichlorobenzenes	12002481									38 L	11,000 L								
Trichloroethane, 1,1,1-	71556									70	15,000								170
Trichloroethane, 1,1,2-	79005									400	10,000								
Trichloroethene (TCE)	na									7.8 L	2,500 L							41 N	1,600
Trichlorophenol, 2,3,5-	na									< 10	4,500 L								
Trichlorophenol, 2,4,5-	95954									< 10	22,000 LB							3 I	
Trichlorophenol, 2,4,6-	88062									< 10	110,000 LB							6 I	
Triclorophenols, (sum)	na									< 10	22,000 L								
Vinyl chloride	75014									10	100								
Xylene	1330207									130 LB	17,000 LB							4 BL	
Xylene, m-	108383									110 LB	18,000 LB								25
Xylene, o-	95476									89 LB	9,300LB								

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Screening Quick Reference Tables for Organics - Sediment

Sources

1 – Assessment & Remediation of Contaminated Sediments (ARCS) Program, Sept 1996. EPA 905-R96-008.

2 – MacDonald et al, 2000. Arch ET&C 39(1):20-
C – Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, Summary Tables Update 2002, www.ccme.ca/publications/ceqg_rcqe.html

3 – Persuad 1993. Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario. Thompson et al., 2005. Enval Monitor & Assessment 110:71-

4 – Buchman 1999. NOAA HAZMAT Report 99-1.

5 – Entry is lower of current VROM Environmental Quality standards or the updated RIVM Environmental Risk Limits. Risk limits are typically divided by 100 to derive the Target value; this computation has not been done here.
Dutch Target/Intervention: E.M.J. Verbruggen, R. Posthumus and A.P. van Wezel, 2001. Ecotoxicological Serious Risk Concentrations for soil, sediment, and (ground)water: updated proposal for first series of compounds. Nat. Inst. Public Health and the Env., and subsequent updates as published elsewhere.
Min. Housing, Spatial Plan. And the Env., 2000. Annexes Circular on target values and intervention values for soil remediations.

6 – Field et al., 2002. ET&C 21:1993-

7 – MacDonald et al., 1996. Ecotox. 5(4):253-
C – Canadian Sediment Quality Guidelines for the Protection of Aquatic Life, Summary Tables Update 2002, www.ccme.ca/publications/ceqg_rcqe.html
€ - DelValls et al., 1999. Ecotox. & Env Rest 2(1):34-

8 – Wash Dept Ecol Publ 95-308, 1995 and 97-323a, 1997
Gries & Waldrow Puget Sound Dredged Disposal Analysis Rept 1996. http://www.ecy.wa.gov/biblio/wac173204.html
plus unpublished information.

9 – EcoUpdate EcoTox Thresholds, http://www.epa.gov/oswer/riskassessment/

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ANALYTE All concentrations in parts per billion unless specified otherwise	CAS Number	GROUND WATER			SURFACE WATERS				SOIL			
		Dutch[1]		MCL[2]	Fresh		Marine		Invertebrates[4]	Mammals[5]	Plants[6]	Other[7]
		Target	Intervention		Acute[3]	Chronic[3]	Acute[3]	Chronic[3]				
2,3,7,8-TCDD (dioxin TEQs)	1746016		0.001 ^{ng}/L S	0.00003	<0.01 *	<0.00001 *				0.000199		
2,4,5-Trichlorphenoxyacetic acid (2,4,5-T)	93765			9 W		36 NZ				596		
2,4-Dichlorophenoxyacetic acid (2,4-D)	94757			70		4.0 CA				27.2		
Acenaphthene	83329				1,700 *	5.8 CA	970 *	40 Eco		682,000	20,000	
Acenaphthylene	208968					4,840 V	300 *C			682,000		
Acetone	67641				28,000 T	1,500 T				2,500		
Acetonitrile	75058					160 NZ				1,370		
Acetophenone	98862									300,000		
Acetylaminofluorene, 2-	53963									596		
Acridine	260946					4.4 CA						
Acrolein	107028				68 *	0.01 NZ	55 *	0.1 NZ		5,270		
Acrylonitrile	107131	0.08	5 S		7,550 *	2,600 *				23.9		1,000,000 M 0.007 D
Alcohol ethoxylated surfactants (AE)	na					140 NZ						
Alcohol ethoxyolated sulfate (AES)	na					650 NZ						
Aldicarb	116063			9 C		1 CA		0.15 CA				
Aldrin	309002	0.009 ^{ng}/L	< 0.1		1.5 (½)	0.017 V	0.65 (½)				3.32 V	0.06 D
Aldrin+Dieldrin+Endrin	na		0.1	<0.03 W								5 D
Allyl chloride	107051									13.4		
Aminobiphenyl, 4-	92671									3.05		
Aminomethylphosphonic acid (AMPA)	1066519	0.797 L										
Amitrole	61825					22 NZ						
Aniline	62533					2.2 CA				56.8		
Anthracene	120127	0.0007	5		13 T	0.73 T 0.012 CA	300 *C			1.48E6		
Aramite	140578									16,600		
Atrazine	1912249	29 ^{ng}/L	76 L	3		1.8 CA		10 BC				0.2 D
Benz[a]anthracene	56553	0.0001	0.5		0.49 T	0.027 T	300 *C			5,210		
Benzene	71432	0.2	30	5	2,300 T	46 Eco	5,100 *	110 CA		255		10 D
Benzidine	92875				70 T	3.9 T						
Benzo(ghi)perylene	191242	0.0003	0.05			7.64 V	300 *C			119,000		
Benzo[a]pyrene	50328	0.0005	0.05	0.2	0.24 T	0.014 T Eco	300 *C			1,520		

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7: M – microbes; A – avian

ANALYTE	CAS Number	GROUND WATER			SURFACE WATERS				SOIL			
All concentrations in parts per billion unless specified otherwise		Dutch[1]		MCL[2]	Fresh		Marine		Invertebrates[4]	Mammals[5]	Plants[6]	Other[7]
		Target	Intervention		Acute[3]	Chronic[3]	Acute[3]	Chronic[3]				
Benzo[b]fluoranthene	205992					9.07 V	300 *C			59,800		
Benzo[k]fluoranthene	207089	0.0004	0.05				300 *C			148,000		
Benzoic acid	65850				740 T	42 T						
Benzyl alcohol	100516				150 T	8.6 T				65,800		
BHC, alpha (α-HCH)	319846	33 ^{ng}/L	<1		39 T	2.2 T				99.4		3 D
BHC, beta (β-HCH)	319857	8 ^{ng}/L	<1		39 T	2.2 T 0.495 V					3.98 V	9 D
BHC, delta δ-HCH)	319868	< 0.05	<1		39 T	2.2 T				9,940		< 10 D
BHC, gamma- (γ-HCH; Lindane)	58899	9 ^{ng}/L	<1	0.2	0.95	0.08	0.08 (½)				5 V	0.05 D
BHC (sum)	na	0.05	1		< 0.95	< 0.08	< 0.08					10 D
Biphenyl	92524					14 T Eco					60,000	
Bis(2-chloroethoxy) methane	111911				11,000 *C		12,000 *C	6,400 *C		302		
Bis(2-chloroethyl) ether	111444					1,900 V				23,700		
Bis(2-ethylhexyl)phthalate (DEHP)	117817	1.9 ^{ng}/L L	< 5	6	400 p	32 Eco 16 CA 0.3 V	400 p	360 p		925		< 100 D
Bis-2-chloro-1-methylethylether	108601									19,900		
Bromocil	314409					5 CA						
Bromodichloromethane (Dichlorobromomethane)	75274			60 W	11,000 *C		12,000 *C	6,400 *C		540		
Bromoform (Tribromomethane)	75252		630		2,300 T	320 T Eco				15,900		
Bromoxynil	1689845			5 C		5 CA						
Butanol	35296721		5,600 S									
Butyl acetate, 1- or 2-	na		6,300 S									
Butyl benzyl phthalate	85687	2.9 ^{ng}/L L	< 5		940 *C	19 T Eco	2,944 *C	3.4 *C		239		< 100 D
Captan	133062					1.3 CA						
Carbaryl	63252	2 ^{ng}/L	41 L	90 C		0.2 CA		0.32 CA				
Carbofuran	1563662	9 ^{ng}/L	6.5 L	40		1.8 CA		0.06 NZ				
Carbon disulfide	75150				17 T	0.92 T				94.1		
Carbon tetrachloride (Tetrachloromethane;Tetra)	56235	0.01	10	5	180 T	9.8 T	50,000 *	5,000 x 0.1		2,980		1,000,000 M 400 D
Catechol (o-Dihydroxybenzene)	120809	0.2	630 L									50 D

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		Dutch[1]		MCL[2]	Fresh		Marine		Invertebrates[4]	Mammals[5]	Plants[6]	Other[7]
		Target	Intervention		Acute[3]	Chronic[3]	Acute[3]	Chronic[3]				
Chlordane	57749	0.02 ^{ng}/L	0.2	2	1.2 (½)	0.00215 (½)	0.045 (½)	0.002 (½)			224 v	0.03 D
Chlordane (alpha)	5103719	< 0.02 ^{ng}/L	< 0.2								< 224 v	< 0.03 D
Chlordane (gamma)	5103742	< 0.02 ^{ng}/L	< 0.2								< 224 v	< 0.03 D
Chlorfenvinphos	470906					0.1 EU		0.1 EU				
Chloroacetamide	79072								2,000			5 D
Chloroaniline	27134265		30									< 5 D
Chloroaniline, 3-	108429		< 30						30,000		20,000	< 5 D
Chloroaniline, 4-	106478		< 30		250 *C	50 *C	160 *C	129 *C		1,100		< 30 D
Chlorobenzenes (sum)	na	< 7	< 180	100		130 Eco <47 V			< 40,000	< 13,100		30 D
Chlorobenzilate	510156									5,050		20 D
Chloroform (trichloromethane)	67663	6	400	200 W	490 T	1.8 CA				1,190		
Chloro, 4- 2-methyl phenol	1570645		< 350 S									
Chloro, 4- 3-methyl phenol	59507		< 350 S							7,950		
Chloro, 4- methyl phenols	na		350 S							< 7,950		
Chloro, 4- 2-methylphenoxy acetic acid (MCPA)	94746	0.02	50	2 W		2.6 CA		4.2 CA				0.05 D
Chloronaphthalene, 1-	90131	3.7 ^{ng}/L L	< 6									
Chloronaphthalene, 2-	91587	0.016 L	< 6		1,600 * C	0.396 V	7.5 * C			12.2		
Chlorophenol, 2-	95578	< 0.3	< 100		4,380 *	490 NZ 24 V				243		< 10 D
Chlorophenol, 3-	108430	< 0.3	< 100						10,000		7,000	< 10 D
Chlorophenol, 4-	106489	< 0.3	< 100			220 NZ						< 10 D
Chlorophenols (sum)	na	0.3	100			< 24 V			< 10,000	< 243	< 7,000	< 10 D
Chloroprene	126998									2.9		
Chlorothalonil	1897456			200 BC		0.18 CA		0.36 CA				
Chlorpyrifos	2921882			30 W	0.083	0.041	0.011	0.0056				
Chrysene	218019	0.003	0.2				300 *C			4,730		
Cresol [m-] (3-Methyl phenol)	108394	< 0.2	< 200							3,490		< 50 D
Cresol [o-] (2-Methyl phenol)	95487	< 0.2	<200		230 T	13 T				40,400		< 50 D
Cresol [p-] (4-Methyl phenol)	106445	< 0.2	< 200							163,000		< 50 D
Cresols, sum	1319773	0.2	200		< 230 T	< 13 T				< 3,490		50 D
Cyclohexanone	108941	0.5	15,000									100 D

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All concentrations in parts per billion unless specified otherwise		Dutch[1]		MCL[2]	Fresh		Marine		Invertebrates[4]	Mammals[5]	Plants[6]	Other[7]
		Target	Intervention		Acute[3]	Chronic[3]	Acute[3]	Chronic[3]				
DDD, 4,4- (p,p-DDD, TDE)	72548	<0.004 ^{ng}/L	< 0.01	< 1 W	0.19 T	0.011 T	3.6 *	0.36 x 0.1		758		< 10 D
DDE, 4,4- (p,p-DDE)	72559	<0.004 ^{ng}/L	< 0.01	< 1 W	1,050 *	105 x 0.1	14 *	1.4 x 0.1		596		< 10 D
DDT, 4,4- (p,p-DDT)	50293	<0.004 ^{ng}/L	< 0.01	< 1 W	0.55 (½)	0.0005 (½)	0.065 (½)	0.0005 (½)		3.5		< 10 D
DDT+DDE+DDD (sum)	na	0.004 ^{ng}/L	0.01	1 W	<0.55 (½)	<0.0005 (½)	<0.065 (½)	<0.0005 (½)		21 EPA		93 A 10 D
Decane	124185				880 T	49 T						
Deltamethrin	52918635					0.0004 CA						
Demeton	8065483					0.1		0.1				
Diallate	2303164									452		
Diazinon	333415			20 C	0.17	0.17	0.82	0.82				
Dibenz[ah]anthracene	53703						300 *C			18,400		
Dibenzofuran	132649				66 T	3.7 T						
Dibromo, 1,2- 3-chloropropane (DBCP)	96128			0.2						35.2		
Dibromochloromethane (Chlorodibromomethane)	124481			100 W	11,000 *C		12,000 *C	6,400 *C		2,050		
Dibromoethane, 1,2-	106934			0.4 W						1,230		
Dicambia	1918009			120 C		10 CA						
Dichloro, 1,4- 2-butene (cis)	1476115											1,000,000 M
Dichloro, 1,4- 2-butene (trans)	110576											1,000,000 M
Dichloroaniline, 2,4-	554007		< 100 S			7 NZ			100,000			< 5 D
Dichloroaniline, 3,4-	95761		< 100 S			3 NZ		150 NZ	20,000			< 5 D
Dichlorobenzene, 1,2-	95501	< 3	< 50	600	260 T	0.7 CA	< 1,970 *S	42 CA		2,960		< 30 D
Dichlorobenzene, 1,3-	541731	< 3	< 50		630 T	71 T Eco 38 V	< 1,970 *S			37,700		< 30 D
Dichlorobenzene, 1,4-	106467	< 3	< 50	75	180 T	15 T Eco 60 NZ 9.4 V	< 1,970 *S	129 *C	20,000	546		< 30 D
Dichlorobenzenes	25321226	3	50	< 75	< 180 T	< 0.7 CA	1,970 *S		< 20,000	< 548		< 30 D
Dichlorobenzidine, 3,3-	91941					4.5 V				646		
Dichlorodifluoromethane	75718									39,500		
Dichloroethane, 1,1-	75343	7	900		830 T	47 T Eco				20,100		20 D
Dichloroethane, 1,2-	107062	7	400	5	8,800 T	100 CA	113,000 *	11,300 x 0.1		21,200		20 D

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		Dutch 1		MCL 2	Fresh		Marine		Invertebrates 4	Mammals 5	Plants 6	Other 7
		Target	Intervention		Acute 3	Chronic 3	Acute 3	Chronic 3				
Dichloroethene, 1,1- (vinylidene chloride)	75354	0.01	10	7	450 T	25 T	224,000 *S			8,280		100 D
Dichloroethene, 1,2- (cis or trans)	540590	0.01	20	70 cis	1,100 T	590 T	224,000 *S					200 D
Dichloroethene, 1,2- (trans)	156605			100	11,600 *S	1,160 x 0.1	224,000 *S			784		
Dichlorophenol, 2,4-	120832	< 0.2	< 30	900 C	2,020 *	160 NZ 11 V				87,500		< 10 D
Dichlorophenol, 2,6-	87650	< 0.2	< 30			< 0.2 CA				1,170		< 10 D
Dichlorophenol, 3,4-	95772	< 0.2	< 30			< 0.2 CA			20,000		20,000	< 10 D
Dichlorophenol, 3,5-	591355	< 0.2	< 30			< 0.2 CA						< 10 D
Dichlorophenols (sum)	na	0.2	30	< 900 C	<2,020 *	0.2 CA			< 20,000	< 1,170	< 20,000	< 10 D
Dichloropropane, 1,2- (propylene dichloride)	78875	< 0.08	< 80	5	23,000 *S	5,700 *S	10,300 *S	3,040 *S	700,000	32,700		< 2 D
Dichloropropene, 1,3-	542756			20 W	0.99 T	0.055 T	790 *S					
Dichloropropene, 1,3- (cis)	10061015			< 20 W	< 0.99 T	< 0.055 T				398		
Dichloropropene, 1,3- (trans)	10061026			< 20 W	< 0.99 T	< 0.055 T				398		
Diclofop-methyl	51338273			9 C		6.1 CA						
Dicofol	115322					0.5 NZ		0.1 NZ				
Didecyl dimethyl ammonium chloride (DDAC)	7173515					1.5 CA						
Dieldrin ‡	60571	0.1 ng/L	< 0.1		0.24	0.056	0.355 (½)	0.00095 (½)		2.38		22 A
Diethyl phthalate	84662	< 0.5	< 5		1,800 T	210 T 110 V	2,944 *C	3.4 *C		24,800	100,000	< 100 D
Diethylene-glycol	111466		13,000 S									
Dihydroxybenzenes, sum	na	0.24 L										
Di-iso-butyl phthalate	84695	< 0.5	< 5									< 100 D
Dimethoate	60515			6 W		6.2 CA 0.15 NZ				218		
Dimethyl aminoazobenzene [p-]	60117									40		
Dimethyl benz(a)anthracene, 7,12-	57976									16,300		
Dimethyl benzidine, 3,3-	119937									104		
Dimethyl naphthalene, 2,6-	581420											
Dimethyl phenethylamine [alpha,alpha]	122098									300		
Dimethyl phenol, 2,4-	105679				2,120 *	100 V					10 V	
Dimethyl phthalate	131113	< 0.5	< 5		940 *C	3 *C	2,944 *C	3.4 *C	200,000	734,000		< 100 D

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		Dutch[1]		MCL[2]	Fresh		Marine		Invertebrates[4]	Mammals[5]	Plants[6]	Other[7]
		Target	Intervention		Acute[3]	Chronic[3]	Acute[3]	Chronic[3]				
Di-n-butyl phthalate	84742	< 0.5	< 5		190 T	19 CA 9.7 V	2,944 *C	3.4 *C		150	200,000	< 100 D
Dinitrobenzene, 1,3-	99650									655		
Dinitrophenol, 2,4-	51285				230 *C	45 NZ 19 V	4,850 *C			60.9		
Dinitrotoluene, 2,4-	121142				330 *	65 NZ 44 V	590 * S	370 *S		1,280		
Dinitrotoluene, 2,6-	606202									32.8		
Di-n-octyl phthalate	117840	< 0.5	< 5		940 *C	3 *C	2,944 *C	3.4 *C		709,000		< 100 D
Dinoseb	88857			7		0.05 CA				21.8		
Dioxane, 1,4-	123911									2,050		
Dioxins (sum of PCDDs)	na		0.001 ^{ng}/L S							0.000199		
Diphenlyhydrazine 1,2-	122667				270 *	27 x 0.1						
Diphenylamine	122394									1,010		
Diquat	85007			20		1.4 NZ						
Disulfoton	298044									19.9		
Diuron	330541			150 C		0.1EU		0.1EU				
Dodecylbenzene	25155300		0.02 S									
Endosulfan (α or β: I or II)	115297	0.2 ^{ng}/L	5		0.11 (½)	0.028 (½)	0.017 (½)	0.00435 (½)		119		0.01 D
Endosulfan sulfate	1031078					2.22 V				35.8		
Endrin	72208	0.04 ^{ng}/L	< 0.1	2	0.086	0.036	0.0185 (½)	0.00115 (½)		10.1		0.04 D
Endrin aldehyde	7421934					0.15 V				10.5		
Esfenvalerate	66230044					0.001 NZ						
Ethanol	64175					1,400 NZ						
Ethyl acetate	141786		15,000 S									
Ethyl benzene	100414	4	150	700	130 T	7.3 T 14 V	430 *	25 CA		5,160		30 D
Ethyl methacrylate	97632									30,000		
Ethylene glycol	107211		5,500 S			192,000 CA						
Famphur	52857									49.7		
Fenitrothion	122145					0.2 NZ						
Fluoranthene	206440	0.003	1		3,980 *	0.04 CA	40 *	11 Eco		122,000		
Fluorene	86737				70 T	3.9 T Eco	300 *C		30,000	122,000		

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		Target	Intervention		Acute [3]	Chronic [3]	Acute [3]	Chronic [3]				
Formaldehyde	50000		50 S	900 W								
Furan	110009										600,000	
Glyphosate	1071836			280 C		65 CA						
Guthion (azinphos-methyl)	865000	0.1 ^{ng}/L	2 S	20 C		0.01 0.02 NZ		0.01				0.005 D
Heptachlor	76448	0.005 ^{ng}/L	0.3	0.4	0.26 (½)	0.0019 (½)	0.0265 (½)	0.0018 (½)		5.98		0.7 D
Heptachlor epoxide	1024573	0.005 ^{ng}/L	3	0.2	0.26 (½)	0.0019 (½)	0.0265 (½)	0.0018 (½)		152		0.0002 D
Hexachlorobenzene	118741	2.1E-7 L	0.5	1	6 p	3.68 p 0.0003 V	160 *C	129 *C		199		1,000,000 M
Hexachlorobutadiene (HCBD)	87683			0.6 W	90 *	1.3 CA 0.053 V	32 *	3.2 x 0.1		39.8		
Hexachlorocyclohexane (BHC)	608731				100 *	10 x 0.1	0.34 *	0.034 x 0.1				
Hexachlorocyclopentadiene	77474			50	7 *	5.2 *	7 *	0.7 x 0.1		755	10,000	
Hexachloroethane	67721				210 T	12 T Eco 8 V	940 *	94 x 0.1		596		
Hexachlorophene	70304									199		
Hexane	110543				10 T	0.58 T						
Hexanone, 2- (methyl butyl ketone)	591786				1,800 T	99 T				12,600		
Hydroquinone (p-dihydroxybenzene)	123319	0.2	800									50 D
Indeno[1,2,3-cd]pyrene	193395	0.0004	0.05			4.31 V	300 *C			109,000		
Iodo, 3- 2-propynl butyl carbamate (IPBC)	55406536					1.9 CA						
Isodrin	465736										3.32 V	
Isophorone	78591				117,000 *	1,170 x 0.1 920 V	12,900 *	1,290 x 0.1		139,000		
Isoproturon	34123596			9 W		0.1 EU		0.1 EU				
Isosafrole	120581									9,940		
Kepone	143500									32.7		
Linar alkylbenzene sulfonates (LAS)	na					280 NZ						
Linuron	335502					7.0 CA						
Malathion	121755			190 C		0.1		0.1				
Maneb	12427382	0.05 ^{ng}/L	0.1									2 D
Methacrylonitrile	126987									57		
Methanol	67561		24,000 S									

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		Target	Intervention		Acute [3]	Chronic [3]	Acute [3]	Chronic [3]				
Methanol	67561		24,000 S									
Methapyrilene	91805									2,780		
Methomyl	16752775					3.5 NZ						
Methoxychlor	72435			40		0.03		0.03		19.9		
Methyl bromide	74839					16 V				235		
Methyl chloride	74873									10,400		
Methyl cholanthrene, 3-	56495									77.9		
Methyl, 2- 4,6-dinitrophenol	534521									144		
Methyl ethyl ketone (MEK; 2-Butanone)	78933		6,000 S		240,000 T	14,000 T				89,600		
Methyl iodide	74884									1,230		
Methyl methacrylate	80626									984,000		
Methyl methanesulfanate	66273									315		
Methyl naphthalene, 1-	90120				37 T	2.1 T						
Methyl naphthalene, 2-	91576					330 V	300 *C			3,240		
Methyl parathion	298000									0.292		
Methyl, 4- 2-pentanone	108101				2,200 T	170 T				443,000		
Methyl-tert-butyl ether (MTBE)	1634044		9,200 S			10,000 CA		5,000 CA				
Methylene bromide (Dibromomethane)	74953				11,000 *C		12,000 *C	6,400 *C		65,000		
Methylene chloride (Dichloromethane, DCM)	75092	0.01	1,000	5	26,000 T	2,200 T 98.1 CA	12,000 *C	6,400 *C		4,050		400 D
Metolachlor	51218452			10 W		7.8 CA						
Metribuzin	21087649			80 C		1 CA						
Mineral oil (Operationally defined)	8012951	50	600									50,000 D
Mirex	2385855					0.001		0.001				
Molinate	2212671			6 W		3.4 NZ						
Monochloroaniline (3 isomers)	na		30									5 D
Monochlorobenzenes	108907	7	180	100	1,100 T	1.3 CA	160 *C	25 CA	40,000	13,100		< 30 D
Monochloronaphthalenes		7.7 ^{ng}/L L	6									120 L
Monochlorophenols (sum)	na	0.3	100			7 CA						< 10 D
Naphthalene	91203	0.01	70		190 T	1.1 CA	2,350 *	1.4 CA		99.4		
Naphthoquinone, 1,4-	130154									1,670		

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		Target	Intervention		Acute [3]	Chronic [3]	Acute [3]	Chronic [3]				
Naphthylamine, 1-	134327									9,340		
Naphthylamine, 2-	91598									3,030		
Nitroaniline [m-]	99092									3,160		
Nitroaniline [p-]	100016									21,900		
Nitroaniline, 2-	88744									74,100		
Nitrobenzene	98953				27,000 *	550 NZ 220 V	6,680 *	668 x 0.1	40,000	1,310		1,000,000 M
Nitro-o-toluidine, 5-	99558									8,730		
Nitrophenol, 2-	88755									1,600		
Nitrophenol, 4-	100027				1,200 T	300 T 60 V	4,850 *C		7,000	5,120		
Nitroquinoline, 4- 1-oxide	56575									122		
Nitrosodiethylamine, N-	55185					768 V				69.3		
Nitrosodimethylamine, N-	62759									0.0321		
Nitroso-di-n-butylamine, N-	924163									267		
Nitroso-di-n-propylamine, N-	621647									544		
Nitrosodiphenylamine, N-	86306				3,800 T	210 T	3,300,000*C		20,000	545		
Nitrosomethylethylamine, N-	10595956									1.66		
Nitrosomorpholine, N-	59892									70.6		
Nitrosopiperidine, N-	100754									6.65		
Nitrosopyrrolidine, N-	930552									12.6		
Nonylphenol	25154523				28	6.6	7	1.7				
o,o-diethyl o-2-pyrazinylphosphorothioate	297972									799,000		
Octanone, 2-	111137				150 T	8.3 T						
PAHs, High MW	na						300 *C		29,000 EPA	100,000 EPA		< 1,000 D
PAHs, Low MW	na						300 *C		18,000 EPA	1,100 EPA		< 1,000 D
PAHs, Total	na						300 *C					1,000 D
Paraquat	4685147					0.5 NZ						
Parathion	56382			50 C	0.065	0.013			0.34 V			
PCBs (sum)	1336363	0.01	0.01	0.5	0.6 T 0.03 NZ	0.014	0.033 T	0.03		0.332	40,000	< 20 D
Pentachloroaniline	527208		1 S						100,000			

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Pentachlorobenzene	608935	0.003	1		8.4 T	0.47 T 0.019 V	160 *C	129 *C	20,000	497		< 30 D
Pentachloroethane	76017				7,240 *	1,100 *	390 *	281 *		10,700		
Pentachloronitrobenzene	82688									7,090		
Pentachlorophenol [PCP: at pH 7.8]	87865	0.04	3	1.0	19 ph	15 Ph	13	7.9	6,000	119	3,000	2,100 A
Pentanol, 1-	71410				2,000 T	110 T						
Permethrin	52645531					0.004 CA		0.001 CA				
Phenacetin	62442									11,700		
Phenanthrene	85018	0.003	5		30 p	6.3 p Eco 3.6 V	7.7 p	4.6 p		45,700		
Phenol	108952	0.2	2,000		10,200 *	320 NZ 180 V	5,800 *	400 NZ	30,000	120,000	70,000	1,000,000 M 500 D
Phenylenediamine [p-]	106503									6,160		
Phorate	298022			2 C						0.496		
Phthalates (sum)	na	0.5	5									100 D
Picloram	1918021			500		29 CA						
Picoline, 2-	109068									9,900		
Polychlorinated dibenzofurans	51207319									0.0386		
Pronamide	23950585										13.6 v	
Propanol, 2- (isopropanol)	67630		31,000 S		130 T	7.5 T						
Propionitrile	107120									49.8		
Propylene glycol	57556					500,000 CA						
Pyrene	129000					0.025 CA	300 *C			78,500		
Pyridine	110861	0.5	30							1,030		100 D
Quinoline	91225					3.4 CA						
Resorcinol (m-dihydroxybenzene)	108463	0.2	600									50 D
Safrole	94597									404		
Silvex (2,4,5-TP)	93721			50							109 v	
Simazine	122349			4		10 CA 3.2 NZ		1 EU				
Styrene (Vinyl benzene)	100425	6	300	100		72 CA 32 V				4,690	300,000	300 D

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Tebuthiuron	34014181			490 BC		1.6 CA 2.2 NZ						
Temephos	3383968					0.05 NZ		0.05 NZ				
Tetrachloroaniline, 2,3,5,6-	3481207		< 10 S						20,000		20,000	
Tetrachlorobenzene, 1,2,3,4-	634662	< 0.01	< 2.5		250 *C	1.8 CA	160 *C	129 *C	10,000			< 30 D
Tetrachlorobenzene, 1,2,3,5-	634902	< 0.01	< 2.5		250 *C		160 *C	129 *C				< 30 D
Tetrachlorobenzene, 1,2,4,5-	95943	< 0.01	< 2.5		250 *C	50 *C 3 V	160 *C	129 *C		2,020		< 30 D
Tetrachlorobenzenes	na	0.01	2.5		250 *C	< 3 V	160 *C	129 *C	< 10,000	< 2,020		< 30 D
Tetrachloroethane, 1,1,1,2-	630206									225,000		
Tetrachloroethane, 1,1,2,2-	79345				2,100 T	111 CA	9,020 *	902 x 0.1		127		
Tetrachloroethylene (Tetrachloroethene; PCE; PER)	127184	0.01	40	5	830 T	98 T 45 V	10,200 *	450 *		9,920		2 D
Tetrachlorophenol, 2,3,4,5-	4901513	< 0.01	< 10			< 1 CA			20,000			< 10 D
Tetrachlorophenol, 2,3,4,6-	58902	< 0.01	< 10	100 C		20 NZ	440 *	44 x 0.1		199		< 10 D
Tetrachlorophenols (sum)	25167833	0.01	10			1 CA			< 20,000	< 199		< 10 D
Tetraethyldithiopyrophosphate	3689245									596		
Tetrahydrofuran	109999	0.5	300									100 D
Tetrahydrothiophene	110010	0.5	5,000									100 D
Thiobencarb	28249776					2.8 NZ						
Thiram	137268					0.2 NZ		0.01 NZ				
Toluene	108883	7	1,000	1,000	120 T	9.8 T 2 CA	6,300 *	215 CA		5,450	200,000	10 D
Toluidine [o-]	95534									2,970		
Toxaphene	8001352			3	0.73	0.0002	0.21	0.0002		119		
Triallate	2303175					0.24 CA						
Tributyltinoxide	56359	<0.05E-16 ng/L	< 0.7		0.46	0.072	0.42	0.0074				< 1 D
Trichloroaniline (multiple isomers)	na		10 S									
Trichloroaniline, 2,4,5-	636306		< 10 S						20,000		20,000	
Trichlorobenzene, 1,2,3-	87616	< 0.10	< 10			8.0 CA			20,000			< 30 D
Trichlorobenzene, 1,2,4-	120821	< 0.10	< 10	70	700 T	24 CA	160 *C	5.4 CA	20,000	11,100		< 30 D
Trichlorobenzenes	12002481	0.01	10	< 70	< 700 T	< 8 CA	160 *C	<5.4 CA	< 20,000	< 11,100		< 30 D

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		Target	Intervention		Acute [3]	Chronic [3]	Acute [3]	Chronic [3]				
Trichloroethane, 1,1,1-	71556	0.01	300	200	200 T	11 T	31,200 *	3,120 x 0.1		29,800		70 D
Trichloroethane, 1,1,2-	79005	0.01	130	5	5,200 T	1,200 T 500 V		1,900 NZ		28,600		400 D
Trichloroethene (TCE)		24	500	5		21 CA	2,000 *	200 x 0.1		12,400		100 D
Trichloroethene, 1,1,1-	71556	< 24	< 500	< 5	< 440 T	< 21 CA						< 100 D
Trichloroethene, 1,1,2-	79016	< 24	< 500	< 5	< 440 T	< 21 CA						< 100 D
Trichlorofluoromethane	75694				11,000 *C		12,000 *C	6,400 *C		16,400		
Trichlorophenol, 2,3,5-		< 0.03	< 10			< 18 CA						< 10 D
Trichlorophenol, 2,4,5-	95954	< 0.03	< 10		100 p	63 p	240 p	11 p	9,000	14,100	4,000	< 10 D
Trichlorophenol, 2,4,6-	88062	< 0.03	< 10	5 C		20 NZ 4.9 V			10,000	9,940		< 10 D
Triclorophenols, (sum)	na	0.03	10			18 CA			< 9,000	<9,940	< 4,000	< 10 D
Trichloropropane, 1,2,3-	96184									3,360		
Triethylphosphorothioate [O,O,O-]	126681									818		
Trifluralin	1582098			20 W		0.2 CA		0.1EU				
Trinitrobenzene, 1,3,5-	99354									376		
Trinitrotoluene, 2,4,6-	118967					140 NZ						
Vinyl acetate	108054				280 T	16 T				12,700		
Vinyl chloride	75014	0.01	5	2		930 V				646		10 D
Xylene, m-	108383	< 0.2	< 70		32 T	1.8 T Eco						< 100
Xylene, o-	95476	< 0.2	< 70			350 NZ						< 100
Xylene, p-		< 0.2	< 70									< 100
Xylenes	1330207	0.2	70	10,000	230 T	13 T					10,000 v	100 D

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Sources

1 – Entry is lower of current VROM Environmental Quality standards or the updated RIVM Environmental Risk Limits. Risk limits are typically divided by 100 to derive the Target value; this computation has been done here.
Dutch Target/Intervention: E.M.J. Verbruggen, R. Posthumus and A.P. van Wezel, 2001. Ecotoxicological Serious Risk Concentrations for soil, sediment, and (ground)water: updated proposal for first series of compounds. Nat. Inst. Public Health and the Env., and subsequent updates as published elsewhere.
Min. Housing, Spatial Plan. And the Env., 2000. Annexes Circular on target values and intervention values for soil remediations.

2 – Primary entry is the US EPA MCL value, followed by the lower of appropriate WHO, Canadian, or British Columbia guidelines.
Maximum Contaminant Levels (MCLs): http://www.epa.gov/safewater/index.html
W – World Health Organization's (WHO) Drinking water guidelines: http://www.who.int/water_sanitation_health/dwq/en/
C – Canadian Environmental Quality Guidelines for Community Water, Summary Table Update 2002: http://www.ccme.ca
BC – British Columbia Water Quality Guidelines (either working or recommended): http://www.env.gov.bc.ca/wat/wq/

3 – Primary entry is the US Ambient Water Quality Criteria, followed by the lowest of Tier II SAVs or available standards or guidelines.
Lowest Observable Effect Levels (LOELs) previously published by EPA are also included since these essentially were the basis for many state standards.
EPA Ambient water Quality Criteria (AWQC): http://www.epa.gov/waterscience/criteria/aqlife.html
T – Tier II Secondary Acute Value: http://www.esd.ornl.gov/programs/ecorisk/tools.html
Eco – EPA EcoUpdate, Ecotox Thresholds, EPA 540/F-95/038
CA – Canadian water Quality Guidelines: http://www.ec.gc.ca/CEQG-RCQE/English/Ceqg/Water/default.cfm
BC – British Columbia Water Quality Guidelines (either working or recommended): http://www.env.gov.bc.ca/wat/wq/
EU – European Union (EU) Environmental Quality Standards: COM(2006) 397 and 398 final.
V – US EPA Region V Ecological Screening Levels: http://www.epa.gov/reg5rcra/ca/edql.htm

4 – Toxicological Benchmarks for Effects on Earthworms: http://www.esd.ornl.gov/programs/ecorisk/tools.html
EPA – Eco-SSL for Invertebrates: http://www.epa.gov/ecotox/ecossl/
Region V Ecological Screening Level for Invertebrates: http://www.epa.gov/reg5rcra/ca/

5 – Entry is lower of either:
Region V Ecological Screening Level for shrew or vole: http://www.epa.gov/reg5rcra/ca/
EPA – Eco-SSL for Mammals: http://www.epa.gov/ecotox/ecossl/

6 – Toxicological Benchmarks for Effects on Terrestrial Plants: http://www.esd.ornl.gov/programs/ecorisk/tools.html
V – EPA Region V Ecological Screening Level for Plants: http://www.epa.gov/reg5rcra/ca/

7 – Entry is lower of either:
M – Toxicological Benchmarks for Effects on Microbes: http://www.esd.ornl.gov/programs/ecorisk/tools.html
A – Eco-SSL for Avian Receptors: http://www.epa.gov/ecotox/ecossl/
D – Entry is lower of current VROM Environmental Quality standards or the updated RIVM Environmental Risk Limits. See #1 above for sources.

Screening Quick Reference Table for PCB Composition

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Degree of Chlorination	A1221 Wt %	A1232 Wt %	A1016 Wt %	A1242 Wt %	A1248 Wt %	A1254 Wt %	A1260 Wt %	A1262 Wt %
Biphenyl	11.7 [a]	6.2 [a]						
∑1 Cl	65.5	31.3	Tr (#1, 3)	Tr (#1, 3)				
∑2 Cl	30.0	26.1	15.2	11.5	Tr (#7, 8)			
∑3 Cl	3.5	21.7	58.2	51.0	21.8	2.1		
∑4 Cl	Tr	15.0	26.5	29.0	60.2	14.3	Tr (#52, 70, 74)	Tr (#52, 70, 74)
∑5 Cl	Tr (#95)	5.8	Tr (#91, 95, 102)	8.5	17.1	53.2	8.2	3.5
∑6 Cl				Tr (#136, 138)	0.8	26.6	47.2	31.6
∑7 Cl					Tr	3.8	37.6	45.8
∑8 Cl						Tr (#202)	6.3	17.7
∑9 Cl							0.7	1.3
Total	99.1%	99.94%	99.95%	100%	99.93%	99.95%	100.01%	99.98%
Prominent congeners [b]	1 3 8 4 15 6	1 8 3 4 15 28	18 28 8 31 33 16	18 28 31 8 33 16	66 70 64 28 52 60	118 110 101 95 138 153	180 138 149 187 174 170	180 153187 149 174 203
Unique congener	#11 Tr					#137	#189 Tr	
Peak Range [c]	1-48	1-74	2-50	2-82	8-106	8-107	31.1-117	31.1-117
Ratio #118:203 [d]	Neither	No #203	Neither	No #203	73	370 - 1230	0.3 – 0.5	0.1
Ratio #31:118 [e]	No #118	4.3	No #118	8.5 - 9.2	2.1	0.01 – 0.04	0.1	No #31
Wt % of #153 [f]				0.1 - 0.14	Tr - 0.52	4.7-6.1	11.0 – 12.2	
Additional Information		~ 1:1 mix of 1221-1242	Distillation of 1242					

Notes

Commercial PCBs were manufactured by chlorination of biphenyl to produce complex mixtures (Aroclors in the USA and Great Britain, Clophens in Germany, or Kanechlors in Japan), each containing 60 to 90 different molecular species *(congeners)* and a specified weight percent of chlorine (for example, 54% in Aroclor 1254). There are 209 distinct congener structures possible, of which about 140 to 150 have been detected at significant levels in commercial PCBs.

Congener distributions in environmental samples roughly resemble those of the parent commercial mixtures, but are often modified due to evaporation, water extraction, microbial oxidation or dechlorination, photochemical dechlorination or differential biological uptake and metabolism. Compositional modification from original Aroclor patterns increases in biotic samples with trophic level. Still, it is often useful or necessary to attempt distinguishing the parent mixture released. The following information is presented to provide assistance with initial, preliminary evaluation of Aroclor. *Aroclor assignment should be conducted only by qualified chemists.*

Total PCBs can be characterized by two primary methods – the sum of congeners, or, the sum of estimates of individual Aroclor concentrations. In lower trophic level samples, these two methods provide approximately equal estimates of total PCBs. At higher trophic levels, analyses of samples tend to overestimate total PCBs by as much as 2-fold using the sum of Aroclor method, due to an overestimation of Aroclor 1254.

Tr - Individual congeners are at trace levels - 0.05 to 0.5% each - and are not included in totals.
- Refers to IUPAC congener number. IUPAC #s 107, 108, 109, 199, 200, 201 correspond to BZ#s 108, 109, 107, 201, 199, and 200, respectively.
a – Biphenyl figures are not reflected in congener weight percentages.
b – The six most prominent peaks listed by IUPAC congener number.
c – In the 118 peak numbering system, peak 1 is biphenyl.
d – This ratio is often used as an indicator for Aroclor 1260.
e – This ratio is often used as an indicator for Aroclor 1248.
f – Congener 153 is persistent in biota and abundantly present in higher chlorinated Aroclors and so provides a degree of modification estimate for biotic samples (increasing modification with decreasing PD values):

$$PD_{153} = \left[\frac{\#153_{theory} - \#153_{sample}}{\#153_{sample}}\right] * 100$$

Screening Quick Reference Table for Toxic Equivalency Factors

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Compound	2005 Mammals / human TEF	1998 Fish TEF	1998 Avian TEF
CHLORINATED DIBENZO-P-DIOXINS			
2,3,7,8-TCDD	1	1	1
1,2,3,7,8-PeCDD	1	1	1
1,2,3,4,7,8-HxCDD	0.1	0.5	0.05
1,2,3,6,7,8-HxCDD	0.1	0.01	0.01
1,2,3,7,8,9-HxCDD	0.1	0.01	0.1
1,2,3,4,6,7,8-HpCDD	0.01	0.001	<0.001
OCDD	0.0003	<0.0001	< 0.0001
CHLORINATED DIBENZOFURANS			
2,3,7,8-TCDF	0.1	0.05	1
1,2,3,7,8-PeCDF	0.03	0.05	0.1
2,3,4,7,8-PeCDF	0.3	0.5	1
1,2,3,4,7,8-HxCDF	0.1	0.1	0.1
1,2,3,6,7,8-HxCDF	0.1	0.1	0.1
1,2,3,7,8,9-HxCDF	0.1	0.1	0.1
2,3,4,6,7,8-HxCDF	0.1	0.1	0.1
1,2,3,4,6,7,8-HpCDF	0.01	0.01	0.01
1,2,3,4,7,8,9-HpCDF	0.01	0.01	0.01
OCDF	0.0003	<0.0001	0.0001
NON-ORTHO-SUBSTITUTED PCBS			
3,3#,4,4#-tetraCB (PCB 77)	0.0001	0.0001	0.05
3,4,4#,5-tetraCB (PCB 81)	0.0003	0.0005	0.1
3,3#,4,4#,5-pentaCB (PCB 126)	0.1	0.005	0.1
3,3#,4,4#,5,5#-hexaCB (PCB 169)	0.03	0.00005	0.001
MONO-ORTHO-SUBSTITUTED PCBs			
2,3,3#, 4,4#-pentaCB (PCB 105)	0.00003	<0.000005	0.0001
2,3,4,4#,5-pentaCB (PCB 114)	0.00003	<0.000005	0.0001
2,3#,4,4#,5-pentaCB (PCB 118)	0.00003	<0.000005	0.00001
2# ,3,4,4# ,5-pentaCB (PCB 123)	0.00003	<0.000005	0.00001
2,3,3#, 4,4#,5-hexaCB (PCB 156)	0.00003	<0.000005	0.0001
2,3,3#,4,4#,5#-hexaCB (PCB 157)	0.00003	<0.000005	0.0001
2,3#,4,4#,5,5#-hexaCB (PCB 167)	0.00003	<0.000005	0.00001
2,3,3#, 4,4#, 5,5#-heptaCB (PCB 189)	0.00003	<0.000005	0.00001

It has been well established that 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), and other chlorinated dioxins, furans, and even PCBs with a similar planar chemical structures are capable of inducing similar toxicity, such as carcinogenicity. Since these compounds generally are observed in mixtures, it is desirable to be able to express the cumulative, overall toxicity of the mixture. However, since each of these congeners does not exhibit the same degree, or potency, of toxicity, some manipulations of raw concentrations are required to express total toxicity.

A number of systems have been developed to express the total, overall toxicity from mixtures of these chemicals. Most commonly, the potency of each congener is weighted relative to a standard, generally the most potent congener. For dioxins and furans, 2,3,7,8-TCDD is the common standard which is given a reference value of one. The weighting, or potency factor, is called a Toxic Equivalency Factor (TEF). When cumulative results are reported, the absolute concentration of each congener is multiplied by its corresponding TEF to derive a TCDD-equivalency. These values are then summed together to give a total Toxic Equivalency Quotient, or TEQ.

The TEQ scheme refers ***only*** to adverse effects (e.g., cancer) following interactions with certain cellular enzyme systems (the Ah receptors). Other toxic effects of dioxins and dioxin-like compounds are not quantified by this method. Because they involve potency to specific enzyme systems, TEF values vary for different animal species.

There are two main schemes:

The two most common systems for determining TEQs are:

1) **I-TEF and I-TEQ:** The older International Toxic Equivalent (I-TEQ) scheme by the North Atlantic Treaty Organization (NATO) initially set up in 1989 and later extended and updated.

2) **WHO-TEF and WHO-TEQ** (also referred to as **TEF** or **TEQ**): More recently, the World Health Organization (WHO) suggested modified Toxic Equivalency Factor (TEF) values for human risk assessment.

ITEQs are most common in North America, while Asia and Europe tend to use WHO-TEQs. On average, the result of TEQ-calculations is about 10% higher when I-TEFs are used compared to when WHO-TEFs are used.

Potency in fish reflects mainly rainbow trout: potency for birds is mainly derived from chickens.

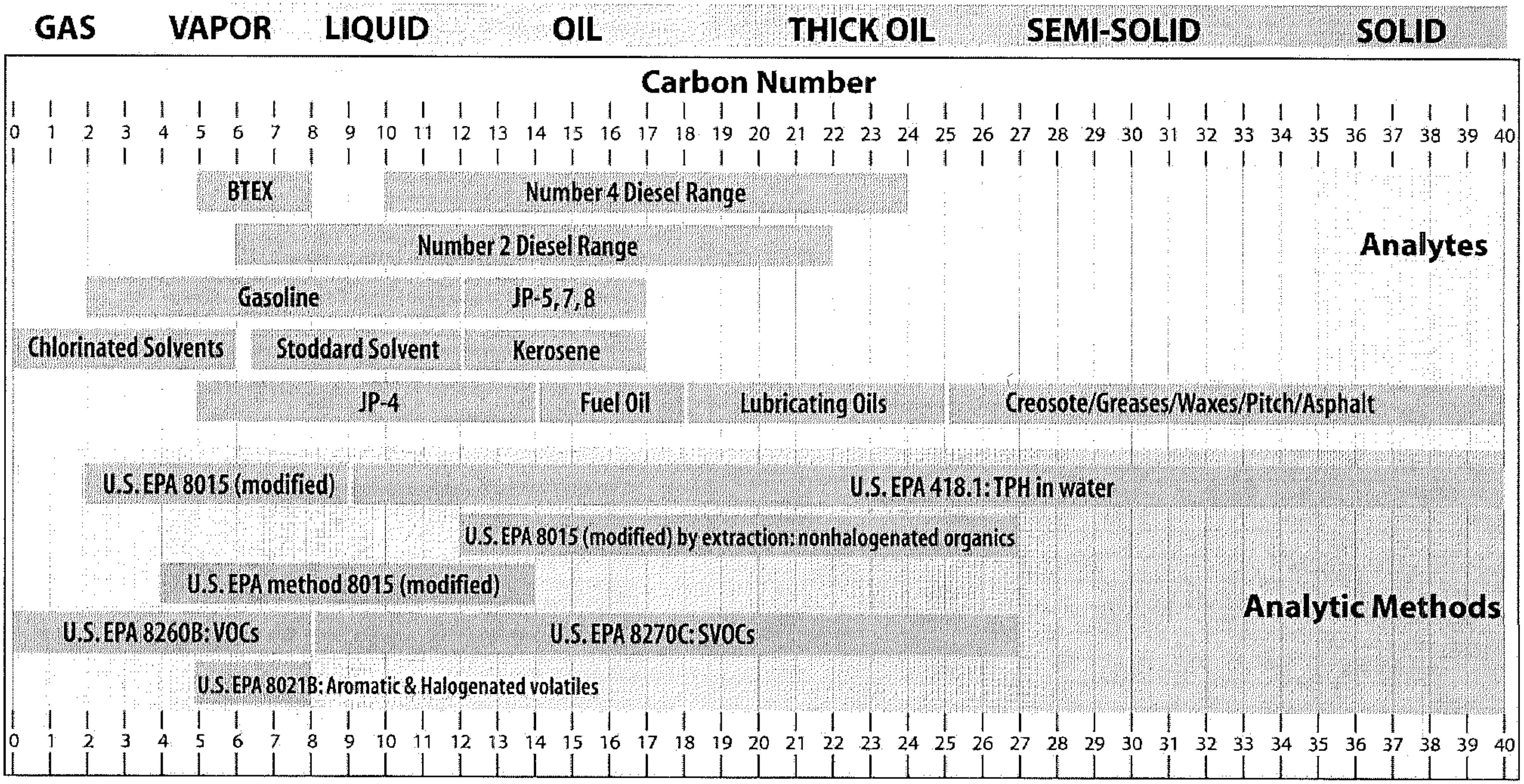
Sources

Van den Berg, M., and others. 1998. "Toxic Equivalency Factors (TEFs) for PCBs, PCDDs, and PCDFs for Humans and Wildlife." *Environmental Health Perspectives.* Volume 106. Pages 775 - 792.

Van den Berg, M., and others. 2006. "The 2005 World Health Organization Re-evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds." *Toxicological Sciences* 93(2):223-241.

Screening Quick Reference Tables for Composition by Carbon Range

These tables were developed for screening purposes only: they do not represent official NOAA policy and do not constitute criteria or clean-up levels.
All attempts have been made to ensure accuracy; however, NOAA is not liable for errors. Values are subject to changes as new data become available.



Carbon ranges are approximate: actual carbon ranges for a specific product are dependent upon the distillation process of the exact source.

Analytic Methods generally refer to EPA SW-846 methods (www.epa.gov/SW-846/index.htm)

Screening Quick Reference Tables for Sample Collection and Storage

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MATERIAL	CONTAINER	PRESERVATION	MAXIMUM HOLDING TIME	SAMPLE SIZE
INORGANICS				
Chromium^{+6} (Cr^{+6})	P,G	Cool, 4°C	24 hours	400 mL/200 g
Mercury (Hg)	P,G	HNO_3, to pH <2	28 days	400 mL/200 g
Metals, except Cr^{+6} and Hg	P,G	HNO_3, to pH <2	6 months	600 mL/200 g
Cyanide by method no. 9010	P,G	Cool 4°C, pH >12 See method 9010	14 days	1,000 mL
Alpha, Beta, and Radium Radiation	P,G	HNO_3 to pH <2	6 months	1,000 mL
ORGANICS				
Benzidines	G, TLC	Cool, 4°C	7 days until extraction, 40 days after extraction	1,000 mL
Chlorinated Hydrocarbons	G, TLC	Cool, 4°C[3]	7 days until extraction, 40 days after extraction	1,000 mL
Dioxins and Furans	G, TLC	Cool, 4°C[3]	30 days until extraction, 45 days after extraction	1,000 mL
Haloethers	G, TLC	Cool, 4°C[3]	7 days until extraction, 40 days after extraction	1,000 mL
Nitrites	G, TLC	Cool, 4°C[3]	14 days	
Nitrosamines	G, TLC	Cool, 4°C[3]	7 days until extraction, 40 days after extraction	1,000 mL
Nitroaromatics and Cyclic Ketones	G, TLC	Cool, 4°C[3]	7 days until extraction, 40 days after extraction	1,000 mL
OIL And GREASE	G	Cool, 4°C[2]	28 days	1,000 mL
TOTAL Organic Carbon, By Method No. 9060	P,G	Cool, 4°C[2] store in the dark	28 days	100 mL
TOTAL Organic Halides By Method No. 9020/9021	G, TLC	Cool, 4°C[2]	28 days	500 mL
PCBs	G, TLC	Cool, 4°C	7 days until extraction, 40 days after extraction	1,000 mL/250 mL
Pesticides	G, TLC	Cool 4°C,	7 days until extraction, 40 days after extraction	1,000 mL/250 mL
Phenols	G, TLC	Cool, 4°C[3]	7 days until extraction, 40 days after extraction	1,000 mL
Phthalate Esters	G, TLC	Cool, 4°C	7 days until extraction, 40 days after extraction	1,000 mL
Polynuclear Aromatic Hydrocarbons	G, TLC	Cool, 4°C[3] store in the dark	7 days until extraction, 40 days after extraction	1,000 mL/250 mL
Purgeable Aromatic Hydrocarbons	VOA	Cool, 4°C[2,3]	14 days	40 mL
Purgeable Halocarbons	VOA	Cool, 4°C[3]	14 days	40 mL

Sources

EPA SW846

1 P - Polyethylene; G - Amber glass containers; TLC - Teflon-lined cap; VOA - Volatile organic analyte vial of amber glass with teflon-lined septum.
2 Adjust to pH <2 with H_2SO_4, HCl, or solid $NaHSO_4$
3 Free chlorine must be removed before addition of HCl by exact addition of $Na_2S_2O_3$

Screening Quick Reference Table
Options for Selection of Analytical Methods: Inorganics

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TRACE ELEMENT	OTHER[1]	FLAME AA	FURNANCE AA	ICP	EXTRACTION METHODS	
					WATER	SOIL/SEDIMENT
Aluminum (Al)	6800	7020		6010B 6020A	3005A 3010A 3015A	3050B 3051A
Antimony (Sb)	6200(55) 6800	7040	7041 7062[3]	6010B 6020A	3005A 3015A	3050B 3051A
Arsenic (As)	6200(60) 7063 7061A[3]		7060 7062[3]	6010B 6020A	3005A 3010A 3015A 7063	3050B 3051A
Barium (Ba)	6200(60) 6800	7080A	7081[3]	6010B 6020A	3005A 3010A 3015A	3050B 3051A
Beryllium (Be)		7090	7091	6010B 6020A	3005A 3010A 3015A 3020A	3050B 3051A
Cadmium (Cd)	6200 6800	7130	7131A	6010B 6020A	3005A 3010A 3015A 3020A	3050B 3051A
Calcium (Ca)	6200 6800	7140		6010B 6020A	3005A 3010A 3015A	3050B 3051A
Chromium (CR), total	6200(200) 6800	7190	7191	6010B 6020A	3005A 3010A 3015A 3020A	3050B 3051A
Chromium+6 (Cr+6)	7195 — 7199[3]				7195 - 7199	3060A
Cobalt (Co)	6200(330)	7200	7201	6010B 6020A	3005A 3010A 3015A 3020A	3050B 3051A
Copper (Cu)	6200(85) 6800	7210	7211[3]	6010B 6020A	3005A 3010A 3015A	3050B 3051A
Iron (Fe)	6200 6 800	7380	7381[3]	6010B 6020A	3005A 3010A 3015A	3050B 3051A
Lead (Pb)	6200(45) 6800	7420	7421	6010B 6020A	3005A 3010A 3015A 3020A	3051A
Magnesium (Mg)	6800	7450		6010B 6020A	3005A 3010A 3015A	3050B 3051A
Manganese (Mn)	6200(240)	7460	7461	6010B 6020A	3005A 3010A 3015A	3050B 3051A
Mercury (Hg)	4500(0.5) 6200 6800 7470A 7471B 7472 7473 7474[3]			6020A	7470A 7472 3015A	3051A 7471B 7473 7474
Molybdenum (Mo)	6200(25) 6800	7480	7481	6010B	3005A 3010A 3015A 3020A	3050B 3051A
Nickel (Ni)	6200(100) 6800	7520	7521	6010B 6020A	3005A 3010A 3015A	3050B 3051A
Potassium (K)	6200 6800	7610		6010B 6020A	3005A 3010A 3015A	3050B 3051A
Selenium (Se)	6200 6800 7741A 7742[3]		7740	6010B 6020A	3005A 3010A 3015A	3050B 3051A
Silver (Ag)	6200 6800	7760A	7761[3]	6010B 6020A	3005A 3015A	3051A 7760 7761
Sodium (Na)		7770		6010B 6020A	3005A 3010A 3015A	3050B 3051A
Strontium (Sr)	6200(30) 6800	7780		6010B	3015A	3050B 3051A
Thallium (Tl)	6200 6800	7840	7841	6010B 6020A	3005A 3010A 3015A 3020A	3050B 3051A
Tin (Sn)	6200(85)	7870				
Vanadium (V)	6200 6800	7910	7911	6010B 6020A	3005A 3010A 3015A 3020A	3050B 3051A
Zinc (Zn)	6200(80) 6800	7950	7951[3]	6010B 6020A	3005A 3010A 3015A	3050B 3051A
Cyanide (HCN)	9010B — 9014[3]					

Sources

All method numbers refer to EPA SW-846, Volume III with changes as proposed for Volume IV.

ICP's advantage is that it allows simultaneous or rapid sequential determination of many elements, but suffers from interferences. AA determinations are normally completed as single element analyses. ICP and Flame AA have comparable detection limits (within a factor of 4), but ICP-MS (6020A) can drastically improve the detection limits (e.g., an order of magnitude lower). Furnace AA generally exhibits lower detection limits than ICP or Flame-AA, and offers more control over unwanted matrix components. X-RAY and immunoassays allow field determinations.

[1] Method 6200 is Portable X-Ray; 6800 is Elemental/Isotope Mass Spec.; 4500 is Immunoassay; 7063 is ASV; where available, soil detection limits in ppm are in parentheses.

[2] Except as noted, most individual procedures are proposed to be integrated into Method 7000B or 7010.

[3] Includes various methods. Follow the extraction procedure detailed in the individual determinative method.

Screening Quick Reference Table
Options for Selection of Analytical Methods: Organics

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COMPOUNDS	FIELD METHODS	OC/MS METHOD	SPECIFIC DETECTION METHOD	HPLC METHOD	EXTRACTION METHODS		CLEANUP METHOD
					WATER	SOIL/SEDIMENT	
Aromatic and Halogenated Volatiles		8260B	8021B		5021 5030B 5032	5021 5032 5035	
Carbamates				8318 8321B	8318 8321B	8318 8321B	8318
Chlorinated Dioxins and Furans			8280B 8290A		8280B 8290A	8280B 8290A 3545A	8280B 8290A
Chlorinated Hydrocarbons		8270D	8121		3510C 3520C 3535A	3540C 3550B	3620B 3640A
Chlorinated Phenoxyacids	4015 (0.1 ppm)	8270D[2]	8151A	8321B	8151A 8321B 3535A	8321B 8151A 3545A 3580A	8151A 3620B
Haloethers		8270D	8111		3510C 3520C	3540C 3545 3550B	3620B 3640A
Nitriles and Amides		8260B	8031 8032A 8033	8315 8316	5030B — 5032 8031 8032A 8316	5031 5032 5035	8032A
Nitroaromatics and Ketones		8270D	8091	8330A	3510C 3520C 3535A	3540C 3545 3550B	3620B 3640A
Nitroaromatics (Explosives)	4050 (0.5 ppm) 4051 8515 (1 ppm)			8330A - 8332	8330A — 8332	8330A — 8332	8330A — 8332 3620B
Nitrosamines		8270D	8070A		3510C 3520C 8070A	3540C 3545 3550B 8070A	3610B 3620B 3640A 8070A
Non-Halogenated Volatiles		8260B	8015B		5030B — 5032	5021 5031 5032 5035	
Organochlorines	4040 — 4042 (0.2 to 20 ppm)	8270D[2]	8081B 8275A		3510C 3520C 3535A	3540C 3545A 3550B 3562	3620B 3630C 3640A 3660
Organophosphates		8270D[2]	8141B	8321B	3510C 3520C 3535A	3540C 3545A 3550B	3620B
PAHs	4035 (1 ppm)	8270D	8100 8275A	8310	3510C 3520C	3540C 3545 3550B 3561	3610B 3630 3640A 3650B
PCBs	4020 (5 ppm) 9078 (2 ppm)	8270D[2]	8082A 8275A		3510C 3520C 3535A	3540C 3545A 3550B 3665A 3562	3620B 3630C 3640A 3660 3665A
Phenolics	4010A (0.5 ppm)	8270D	8041		3510C 3520C	3540C 3545 3550B	3630 3640A 3650B 8041
Phthalates		8270D	8061A		3510C 3520C 3535A	3540C 3545 3550B	3610B 3620B 3640A
Semi-Volatile Organics		8270D			3510C 3520C 3535A	3540C 3545A 3550B	3640A 3650B 3660
Total Organic Halides (TOX)			9020B 9022		9020B 9022		
Total Petroleum Hydrocarbons	4030 (5 ppm) 9074		8015B				
Volatile Organics		8260B	8015B 8021B		5030B — 5032	5021 5031 5032 5035	

Sources

All method numbers refer to EPA SW-846, Update III, with changes as proposed in Update IV.

Options shown are generally for chemical classes; more detailed information may be available for specific compounds

GC/MS methods allow for scanning a broad range of volatile and semi-volatile compounds, but suffer from interference and higher detection limits.

Specific determination methods and HPLC methods allow for more precise determinations of specific compounds of interest.

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[1] Series 4000 are immunoassays and are for specific compounds within these classes (i.e., 2,4-D, TNT, RDX, and PCP). Soil detection limits are in parentheses.

[2] This is not a method of choice, but rather a confirmatory method.

Screening Quick Reference Tables

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Because trace elements are naturally occurring compounds, concentrations reflective of non-anthropogenically impacted, or "background," are provided in addition to toxicological benchmarks. For screening, trace element levels may be compared to the geometric mean (and range) observed in natural soils in the U.S. Further comparisons to regional values is encouraged.

Promulgated criteria or standards for sediments or soils are generally not available in the U.S. For screening purposes, contaminant levels in solids (sediment or soil) may be compared to benchmarks representative of different characterizations of ecological risk. They should ***not*** be applied without a reasonable understanding of their development, their performance, and their limitations.

The NOAA SQuiRTs include multiple sediment screening values to help portray a spectrum of concentrations which have been associated with various probabilities of adverse biological effects. This spectrum ranges from presumably nearly non-toxic to toxic levels. For instance, if all analytes screen below lower-threshold values (for example, TELs), this suggests, with a high degree of confidence, that a sample with these levels of contaminants has a low probability of being toxic, as tested through standard bioassays. Conversely, exceeding lower thresholds does ***not*** necessarily predict toxicity. Comparison to higher toxicity thresholds (for example, PELs) identifies compounds which are more probably present at elevated, toxic levels.

Sources of benchmarks for sediment were chosen primarily on the basis of representing a fairly unique approach for their derivation. A major exception is the "Consensus TEC/PEC" values: these values are simply averages of other existing benchmarks (mostly those appearing in the SQuiRT cards). The consensus TEC/PECs are provided here merely as a service.

For soil- and sediment-associated contaminants, dry weight concentrations are screened directly against published benchmarks. Some benchmarks are available only on a Total Organic Carbon (TOC) normalized basis, and are footnoted as such. Separate values are provided for either freshwater and estuarine or marine sediments.

For freshwater sediments, the Upper Effects Threshold (UET) was derived by NOAA as the lowest AET from a compilation of endpoint analogous to the marine AET endpoints. The UETs for organic contaminants are generally listed for a sediment containing 1% TOC.

This version of the SQuiRT cards adds a section on the composition of PCBs. A characterization of Aroclors by their degree of chlorination and congener patterns may aid in *preliminary* exploration of source type. Definitive Aroclor assignment should only be conducted by a qualified chemist.

To express cumulative toxicity from mixtures of dioxins and furans, Toxic Equivalency Factors are included in this version of the SQuiRT cards. Absolute concentrations can be multiplied by the TEF potency factors and the products then summed to derive total toxicity.

Every effort has been made to ensure accuracy in these SQuiRT cards. However, NOAA is not liable for errors in original sources or revision of values. These screening values are subject to change as new data become available. The SQuiRT cards may be freely reproduced and distributed, if they are distributed in their entirety, without modification, and properly credited to NOAA.

The SQuiRT cards should be cited as:

"Buchman, M. F., 2008. NOAA Screening Quick Reference Tables, NOAA OR&R Report 08-1, Seattle WA, Office of Response and Restoration Division, National Oceanic and Atmospheric Administration, 34 pages."

Appendix D.2:
Field Sampling Documentation

vhb
Field Notes

Date: 6/23/20 **Notes Taken By:** A~R
Place: Mill Pond
Project No.: 52633 **Re:**

Field Sampling Data Sheet

General Information:

Date and Time: 6/23/20 / 1200	VHB Project #: 52633
Location (Town/City): Durham N.H.	Project Name: Mill Pond
Field Sampler: A~R / PW	Project Manager: Peter Walker
Photo #(s) and Direction:	

Weather Conditions:

Current Weather and Temperature: Sunny - 80°

Weather within previous 72 hrs: Sunny - warm

Sample Information:

Sample ID #: SED-13

Sample Location (GPS Coordinates or field ties): ON Tablet

Water Depth: ↓

Probing Depth:

vhb

Field Notes

Sediment Type:
Organic Silt and clay

Sediment Description:
Dark Brown/Black organic silt and clay, tr. f-Sand

Sample Type (composite, grab, etc.):
Composite

Approx. Length of Sediment Core:
2 Cores – ~80% Recovery

Depth of penetration of the core into the sediment / amount of sediment recovery:

Additional Comments / Observations:

vhb
Field Notes

Date: 6/23/20 **Notes Taken By:** AwR

Place: Mill Pond

Project No.: 52633 **Re:**

Field Sampling Data Sheet

General Information:

Date and Time: 6/23/20 / 1100	VHB Project #: 52633
Location (Town/City): Durham, NH	Project Name: Mill Pond
Field Sampler: AwR / PW	Project Manager: Peter walker
Photo #(s) and Direction:	

Weather Conditions:

Current Weather and Temperature: Sunny – 75°
Weather within previous 72 hrs: warm / Sunny

Sample Information:

Sample ID #: SED-14
Sample Location (GPS Coordinates or field ties): On Tablet
Water Depth: ↓
Probing Depth:

Sediment Type:
organic silt and clay

Sediment Description:
Brown/Dark Brown/Black, organics with silt and clay, tr. f-Sand

Sample Type (composite, grab, etc.):
Composite

Approx. Length of Sediment Core:
2 Cores – ~ 80% Recovery

Depth of penetration of the core into the sediment / amount of sediment recovery:

Additional Comments / Observations:

vhb
Field Notes

Date: 6/23/2020
Place: Mill Pond
Notes Taken By: AwR
Project No.: 52633
Re:

Field Sampling Data Sheet

General Information:

Date and Time: 6/23/20 / 1000	VHB Project #: 52633
Location (Town/City): Durham, N.H.	Project Name: Mill Pond
Field Sampler: AwR / PW	Project Manager: Peter Walker
Photo #(s) and Direction:	

Weather Conditions:

Current Weather and Temperature: Sunny - 75°

Weather within previous 72 hrs: Sunny - warm

Sample Information:

Sample ID #: SED - 15

Sample Location (GPS Coordinates or field ties): on Tablet

Water Depth: ↓

Probing Depth: ↓

Sediment Type:
organic silt and clay

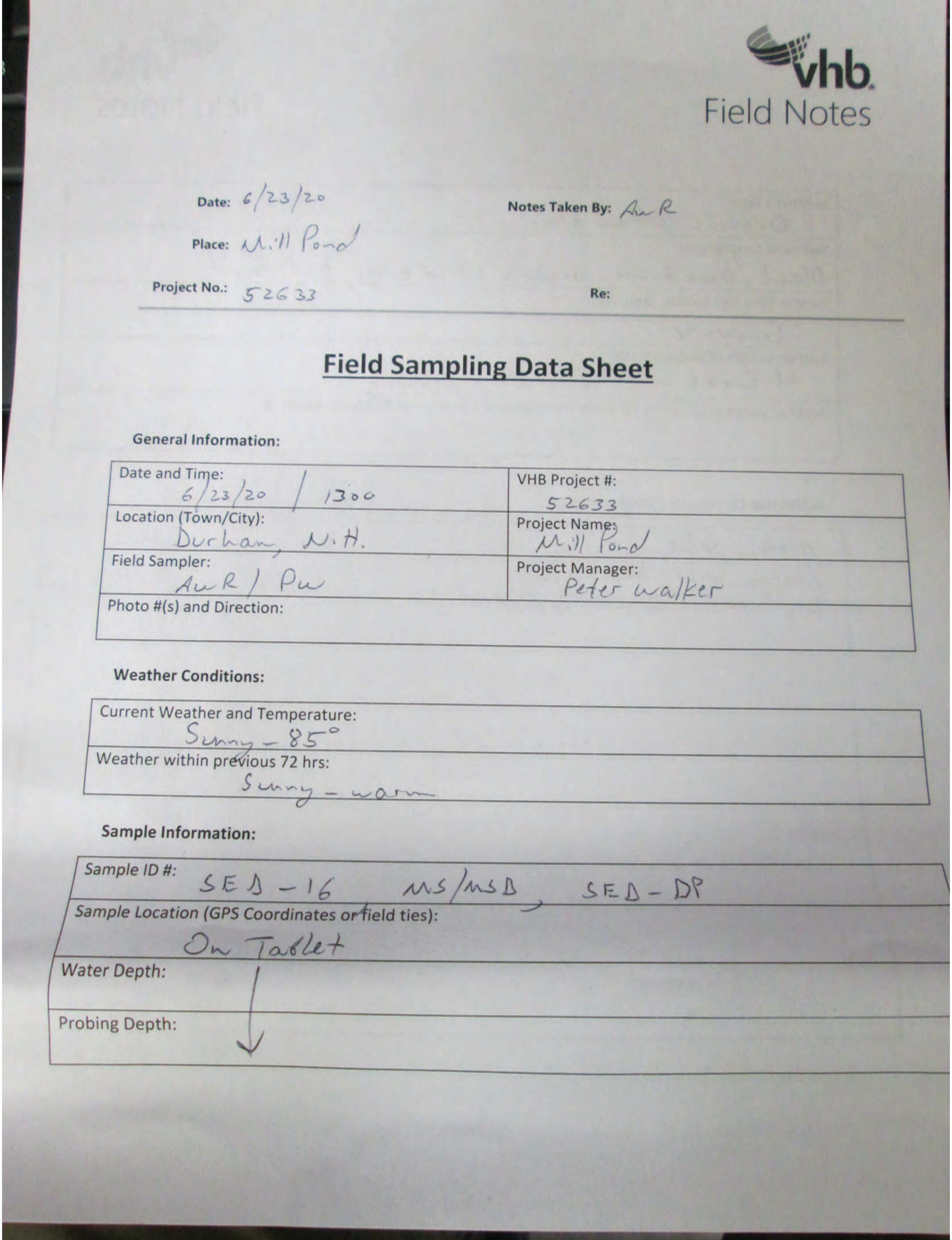
Sediment Description:
Dark Brown / Black clay and silt with organic sediment, little f sand tr. gravel)

Sample Type (composite, grab, etc.):
Composite

Approx. Length of Sediment Core:
2 Cores - ~ 80% recovery

Depth of penetration of the core into the sediment / amount of sediment recovery:

Additional Comments / Observations:



vhb.
Field Notes

Date: 6/23/20
Notes Taken By: AwR
Place: Mill Pond
Project No.: 52633
Re:

Field Sampling Data Sheet

General Information:

Date and Time: 6/23/20 / 1300	VHB Project #: 52633
Location (Town/City): Durham, N.H.	Project Name: Mill Pond
Field Sampler: AwR / Pw	Project Manager: Peter walker
Photo #(s) and Direction:	

Weather Conditions:

Current Weather and Temperature: Sunny - 85°
Weather within previous 72 hrs: Sunny - warm

Sample Information:

Sample ID #: SED-16 MS/MSD, SED-DP
Sample Location (GPS Coordinates or field ties): On Tablet
Water Depth: ↓
Probing Depth:

vhb

Field Notes

Sediment Type:
Organic silt and clay

Sediment Description:
Black / Dark Brown, organic silt and clay, tr. f-Sand.

Sample Type (composite, grab, etc.):
Composite

Approx. Length of Sediment Core:
4 Cores – ~75 – 80% Recovery

Depth of penetration of the core into the sediment / amount of sediment recovery:

Additional Comments / Observations:

Matrix Spike
Matrix Spike Duplicate
Duplicate Sample Collected.

Date: 6/23/20 **Notes Taken By:** AwR

Place: Mill Pond

Project No.: 52633 **Re:**

Field Sampling Data Sheet

General Information:

Date and Time: 6/23/20 / 1600	VHB Project #: 52633
Location (Town/City): Durham, N.H.	Project Name: Mill Pond
Field Sampler: AwR / Pw	Project Manager: Peter walker
Photo #(s) and Direction:	

Weather Conditions:

Current Weather and Temperature: Sunny - 90°

Weather within previous 72 hrs: warm, Sunny

Sample Information:

Sample ID #: SED-17

Sample Location (GPS Coordinates or field ties): On Tablet

Water Depth: ↓

Probing Depth:

Sediment Type:
organic

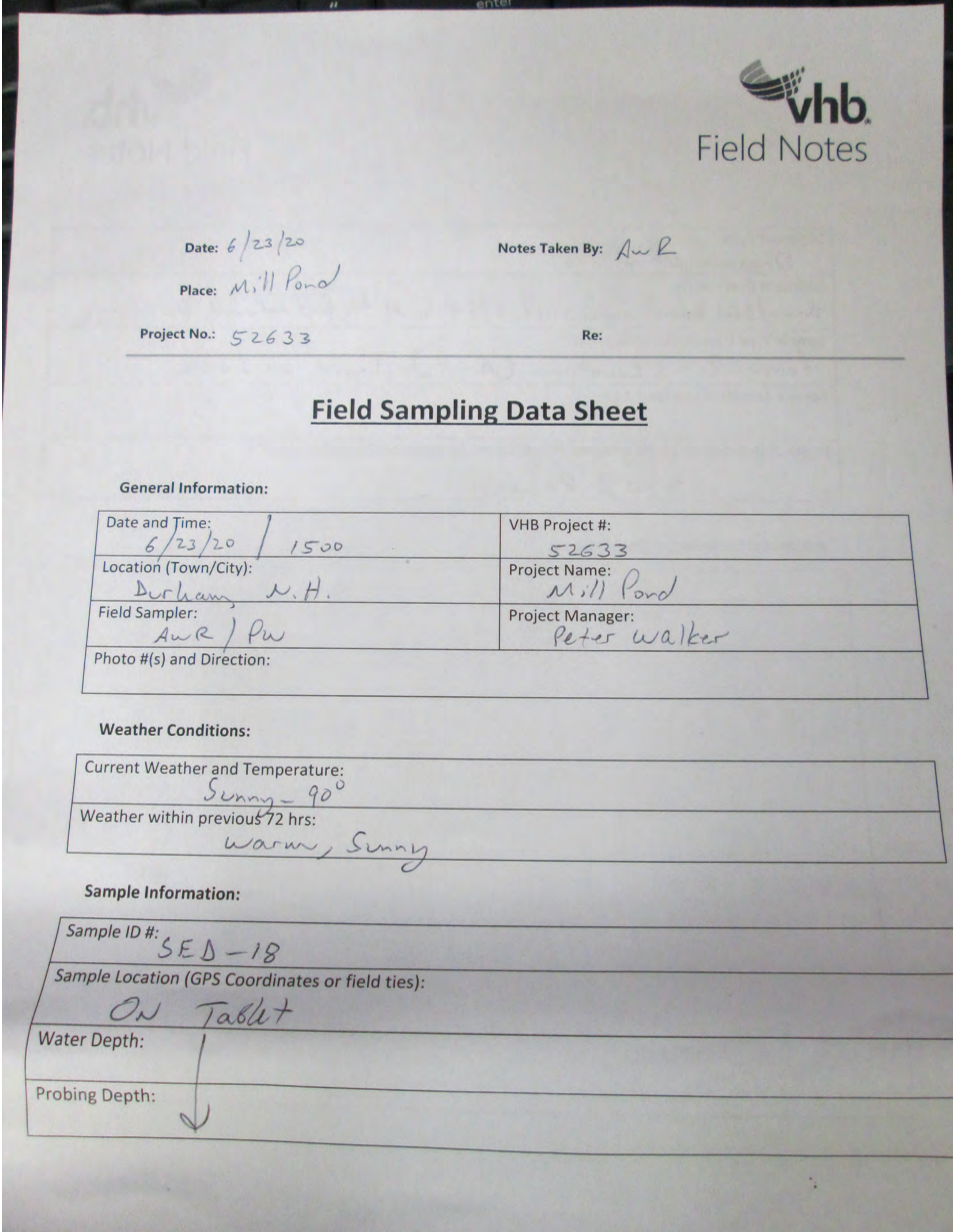
Sediment Description:
Brown/Dark Brown organic silt, some f-m sand, tr. gravel, few clam shells

Sample Type (composite, grab, etc.):
Composite – 5 Locations (A–E) – 1 core at Each

Approx. Length of Sediment Core:

Depth of penetration of the core into the sediment / amount of sediment recovery:

Additional Comments / Observations:



vhb
Field Notes

Date: 6/23/20 **Notes Taken By:** AwR

Place: Mill Pond

Project No.: 52633 **Re:**

Field Sampling Data Sheet

General Information:

Date and Time: 6/23/20 / 1500	VHB Project #: 52633
Location (Town/City): Durham, N.H.	Project Name: Mill Pond
Field Sampler: AwR / Pw	Project Manager: Peter Walker
Photo #(s) and Direction:	

Weather Conditions:

Current Weather and Temperature: Sunny - 90°
Weather within previous 72 hrs: warm, Sunny

Sample Information:

Sample ID #: SED-18
Sample Location (GPS Coordinates or field ties): ON Tablet
Water Depth: ↓
Probing Depth: ↓

Sediment Type:
Organic silt and clay

Sediment Description:
Brown/Dark Brown organic silt, little f-Sand, tr. Peat and wood, few clam shells

Sample Type (composite, grab, etc.):
Composite - 5 Locations (A - E) 1 core at Each

Approx. Length of Sediment Core:

Depth of penetration of the core into the sediment / amount of sediment recovery:
~80% Recovery

Additional Comments / Observations:

Appendix D.3:

Sediment Sample Analytical Results and Screening Analyses

Table X.3-1
Summary of Sediment Sample Analytical Results
Feasbility Study
Oyster River Dam at Mill Pond
Durham, New Hampshire

Field Sample Data Sample Date		SED1 10/31/2009		SED2 10/30/2009		SED3 10/31/2009		SED4 10/31/2009		SED5 10/31/2009		SED6 10/31/2009		SED7 10/31/2009		SED8 10/31/2009		SED9 10/31/2009		SED10a 11/2/2009		SED10b 11/2/2009		SED11a 11/2/2009		SED11b 11/2/2009		SED12 11/2/2009		SED-13 06/23/2020		SED-14 06/23/2020		SED-15 06/23/2020	
Sieve - Grain Description		1% G 54% S 45% S/C		0% G 13% S 87% S/C		0.2% G 43% S 57% S/C		0% G 10% S 90% S/C		N/A		0% G 3% S 97% S/C		(0-2') 0.7% G; 29% S; 70% S/C (2-3') 0.5% G; 22% S 77% S/C		1% G 24% S 75% S/C		0.5% G 12% S 88% S/C		0.1% G 39% S 69% S/C		N/A		0% G 10% S 90% S/C		N/A		33% G 30% S 35% S/C		0% G 42.7% S 57.3% F		0.1% G 58.9% S 41.1% F		0.1% G 28.4% S 71.5% F	
Analyte	CAS #	Result	QL (RL)	Result	QL (RL)	Result	QL (RL)	Result	QL (RL)	Result	QL (RL)	Result	QL (RL)	Result	QL (RL)	Result	QL (RL)	Result	QL (RL)	Result	QL (RL)	Result	QL (RL)	Result	QL (RL)	Result	QL (RL)	Result	QL (RL)	Result	QL (MDL)	Result	QL (MDL)	Result	QL (MDL)
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA Method 8270/8270 SIM (mg/kg)																																			
Naphthalene	91-20-3	0.640	U	0.700	U	0.72	U	1.10	U	0.800	U	1.00	U	0.740	U	0.810	U	0.860	U	0.990	U	0.890	U	0.670	U	0.680	U	0.990	U	0.0064	U	0.0057	U	0.050	
2-methylnaphthalene	91-57-6	0.640	U	0.700	U	0.72	U	1.10	U	0.800	U	1.00	U	0.740	U	0.810	U	0.860	U	0.990	U	0.890	U	0.670	U	0.680	U	0.990	U	0.0053	U	0.0047	U	0.034	
Acenaphthylene	208-96-8	0.640	U	0.700	U	0.72	U	1.10	U	0.800	U	1.00	U	0.740	U	0.810	U	0.860	U	0.990	U	0.890	U	0.670	U	0.680	U	0.990	U	0.0050	J	0.016		0.17	
Acenaphthene	83-32-9	0.640	U	0.700	U	0.72	U	1.10	U	0.800	U	1.00	U	0.740	U	0.810	U	0.860	U	0.990	U	0.890	U	0.670	U	0.680	U	0.990	U	0.0035	U	0.0031	U	0.023	
Dibenzofuran	132-64-9	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		0.0041	U	0.0036	U	0.021	
Fluorene	86-73-7	0.640	U	0.700	U	0.72	U	1.10	U	0.800	U	1.00	U	0.740	U	0.810	U	0.860	U	0.990	U	0.890	U	0.670	U	0.680	U	0.990	U	0.0022	U	0.0019	U	0.055	
Phenanthrene	85-01-8	0.640	U	0.847		1.1		1.10	U	0.800	U	1.00	U	0.463	J	0.623	J	0.860	U	0.630	J	0.508	J	0.670	U	0.680	U	0.990	U	0.022		0.031		0.72	
Anthracene	120-12-7	0.640	U	0.700	U	0.72	U	1.10	U	0.800	U	1.00	U	0.740	U	0.81	U	0.860	U	0.990	U	0.890	U	0.670	U	0.680	U	0.990	U	0.0030	J	0.010	J	0.15	
Fluoranthene	206-44-0	0.640	U	1.53		2.21		0.639	J	0.800	U	1.22		0.774		1.09		0.860	U	1.24		0.982		0.670	U	0.680	U	0.990	U	0.040		0.076		1.1	
Pyrene	129-00-0	0.640	U	1.33		1.97		0.588	J	0.800	U	1.10		0.730	J	1.06		0.860	U	1.14		0.901		0.670	U	0.680	U	0.990	U	0.040		0.079		1.1	
Benzo(a)anthracene	56-55-3	0.640	U	0.583	J	0.91		1.10	U	0.800	U	1.00	U	0.740	U	0.434	J	0.860	U	0.990	U	0.890	U	0.670	U	0.680	U	0.990	U	0.010	J	0.039		0.4	
Chrysene	218-01-9	0.640	U	0.798		1.14		1.10	U	0.800	U	0.668	J	0.451	J	0.593	J	0.860	U	0.673	J	0.546	J	0.670	U	0.680	U	0.990	U	0.015		0.042		0.55	
Benzo(b)fluoranthene	205-99-2	0.640	U	1.06		1.54		1.10	U	0.800	U	0.945	J	0.658	J	0.809	J	0.860	U	0.983	J	0.809	J	0.670	U	0.680	U	0.990	U	0.015		0.046		0.49	
Benzo(k)fluoranthene	207-08-9	0.640	U	0.799	U	0.434	J	1.10	U	0.800	U	1.00	U	0.740	U	0.810	U	0.860	U	0.990	U	0.890	U	0.670	U	0.680	U	0.990	U	0.010	J	0.048		0.48	
Benzo(a)pyrene	50-32-8	0.640	U	0.661	J	0.992		1.10	U	0.800	U	0.616	J	0.740	U	0.516	J	0.860	U	0.594	J	0.890	U	0.670	U	0.680	U	0.990	U	0.027		0.058		0.54	
Indeno(1,2,3-cd)pyrene	193-39-5	0.640	U	0.698	J	0.901		0.602	J	0.800	U	0.806	J	0.532	J	0.659	J	0.860	U	0.767	J	0.665	J	0.670	U	0.680	U	0.990	U	0.014		0.041		0.38	
Dibenzo(a,h)anthracene	53-70-3	0.640	U	0.700	U	0.437	J	1.10	U	0.800	U	1.00	U	0.740	U	0.810	U	0.860	U	0.990	U	0.890	U	0.670	U	0.680	U	0.990	U	0.0020	J	0.010	J	0.12	
Benzo(g,h,i)perylene	191-24-2	0.640	U	0.453	J	0.617	J	1.10	U	0.800	U	1.00	U	0.740	U	0.810	U	0.860	U	0.990	U	0.890	U	0.670	U	0.680	U	0.990	U	0.010	J	0.040		0.42	
Pesticides by EPA Method 8081 (mg/kg)																																			
alpha-BHC	319-84-6	0.017	U	0.180	U	0.200	U	0.028	U	0.021	U	0.270	U	0.200	U	0.210	U	0.240	U	0.026	U	0.240	U	0.018	U	0.017	U	0.560	U	0.0085	U	0.0074	U	0.0062	U
beta-BHC	319-85-7	0.017	U	0.180	U	0.200	U	0.028	U	0.021	U	0.270	U	0.200	U	0.210	U	0.240	U	0.026	U	0.240	U	0.018	U	0.017	U	0.560	U	0.011	U	0.0098	U	0.0082	U
delta-BHC	319-86-8	0.017	U	0.180	U	0.200	U	0.028	U	0.021	U	0.270	U	0.200	U	0.210	U	0.240	U	0.026	U	0.240	U	0.018	U	0.017	U	0.560	U	0.011	U	0.0098	U	0.0082	U
gamma-BHC (Lindane)	58-89-9	0.017	U	0.180	U	0.200	U	0.028	U	0.021	U	0.270	U	0.200	U	0.210	U	0.240	U	0.026	U	0.240	U	0.018	U	0.017	U	0.560	U	0.011	U	0.0098	U	0.0082	U
Heptachlor	76-44-8	0.017	U	0.180	U	0.200	U	0.028	U	0.021	U	0.270	U	0.200	U	0.210	U	0.240	U	0.026	U	0.240	U	0.018	U	0.017	U	0.560	U	0.011	U	0.0098	U	0.0082	U
Aldrin	309-00-2	0.017	U	0.180	U	0.200	U	0.028	U	0.021	U	0.270	U	0.200	U	0.210	U	0.240	U	0.026	U	0.240	U	0.018	U	0.017	U	0.560	U	0.014	U	0.012	U	0.010	U
Heptachlor Epoxide	1024-57-3	0.017	U	0.180	U	0.200	U	0.028	U	0.021	U	0.270	U	0.200	U	0.210	U	0.240	U	0.026	U	0.240	U	0.018	U	0.017	U	0.560	U	0.020	U	0.017	U	0.014	U
Endosulfan I	959-98-8	0.017	U	0.180	U	0.200	U	0.028	U	0.021	U	0.270	U	0.200	U	0.210	U	0.240	U	0.026	U	0.240	U	0.018	U	0.017	U	0.560	U	0.014	U	0.012	U	0.010	U
Dieldrin	60-57-1	0.017	U	0.180	U	0.200	U	0.028	U	0.021	U	0.270	U	0.200	U	0.210	U	0.240	U	0.026	U	0.240	U	0.018	U	0.017	U	0.560	U	0.014	U	0.012	U	0.010	U
4,4'-DDE	72-55-9	0.017	U	0.180	U	0.200	U	0.028	U	0.021	U	0.270	U	0.200	U	0.210	U	0.240	U	0.026	U	0.240	U	0.018	U	0.017	U	0.560	U	0.020	U	0.017	U	0.014	U
Endrin	72-20-8	0.017	U	0.180	U	0.200	U	0.028	U	0.021	U	0.270	U	0.200	U	0.210	U	0.240	U	0.026	U	0.240	U	0.018	U	0.017	U	0.560	U	0.020	U	0.017	U	0.014	U
Endosulfan II	33213-65-9	0.017	U	0.180	U	0.200	U	0.028	U	0.021	U	0.270	U	0.200	U	0.210	U	0.240	U	0.026	U	0.240	U	0.018	U	0.017	U	0.560	U	0.017	U	0.015	U	0.012	U
4,4'-DDD	72-54-8	0.017	U	0.180	U	0.200	U	0.028	U	0.021	U	0.270	U	0.200	U	0.210	U	0.240	U	0.026	U	0.240	U	0.018	U	0.017	U	0.560	U	0.017	U	0.015	U	0.012	U
Endosulfan Sulfate	1031-07-8	0.017	U	0.180	U	0.200	U	0.028	U	0.021	U	0.270	U	0.200	U	0.210	U	0.240	U	0.026	U	0.240	U	0.018	U	0.017	U	0.560	U	0.0085	U	0.0074	U	0.0062	U
4,4'-DDT	50-29-3	0.017	U	0.180	U	0.200	U	0.028	U	0.021	U	0.270	U	0.200	U	0.210	U	0.240	U	0.026	U	0.240	U	0.018	U	0.017	U	0.560	U	0.017	U	0.015	U	0.012	U
Methoxychlor	72-43-5	0.026	U	0.270	U	0.300	U	0.042	U	0.032	U	0.410	U	0.300	U	0.320	U	0.360	U	0.039	U	0.360	U	0.027	U	0.026	U	0.840	U	0.031	U	0.027	U	0.023	U
Endrin Ketone	53494-70-5	0.017	U	0.180	U	0.200	U	0.028	U	0.021	U	0.270	U	0.200	U	0.210	U	0.240	U	0.026	U	0.240	U	0.018	U	0.017	U	0.560	U	0.020	U	0.017	U	0.014	U
Endrin Aldehyde	7421-93-4	0.017	U	0.180	U	0.200	U	0.028	U	0.021	U	0.270	U	0.200	U	0.210	U	0.240	U	0.026	U	0.240	U	0.018	U	0.017	U	0.560	U	0.043	U	0.037	U	0.031	U
Chlordane	57-74-9	0.056	U	0.590	U	0.660	U	0.092	U	0.069	U	0.890	U	0.660	U	0.690	U	0.790	U	0.086	U	0.790	U	0.059	U	0.056	U	1.85	U	NA		NA		NA	
alpha-Chlordane	5103-71-9	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		0.014	U	0.012	U	0.010	U
gamma-Chlordane	5103-74-2	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		0.014	U	0.012	U	0.010	U
Toxaphene	8001-35-2	0.11	U	1.19	U	1.32	U	0.180	U	0.140	U	1.78	U	1.32	U	1.39	U	1.58	U	0.17	U	1.58	U	0.12	U	0.11	U	3.70	U	0.11	U	0.098	U	0.082	U
Polychlorinated Biphenols (PCBs) by EPA Method 8082 (mg/kg)																																			
PCB-1016	12674-11-2	0.026	U	0.270	U	0.300	U	0.042	U	0.032	U	0.410	U	0.300	U	0.320	U	0.360	U	0.039	U	0.360	U	0.027	U	0.026	U	0.840	U	0.030	U	0.021	U	0.017	U
PCB-1221	11104-28-2	0.026	U	0.270	U	0.300	U	0.042	U	0.032	U	0.410	U	0.300	U	0.320	U	0.360	U	0.039	U	0.360	U	0.027	U	0.026	U	0.840	U	0.030	U	0.021	U	0.017	U
PCB-1232	11141-16-5	0.026	U	0.270	U	0.300	U	0.042	U	0.032	U	0.410	U	0.300	U	0.320	U	0.360	U	0.039	U	0.360	U	0.027	U	0.026	U	0.840	U	0.030	U	0.021	U	0.017	U
PCB-1242	53469-21-9	0.026	U	0.270	U	0.300	U	0.042	U	0.032	U	0.410	U	0.300	U	0.320	U	0.360	U	0.039	U	0.360	U	0.027	U	0.026	U	0.840	U	0.030	U	0.021	U	0.017	U
PCB-1248	12672-29-6	0.026	U	0.270	U	0.300	U	0.042	U	0.032	U	0.410	U	0.300	U	0.320	U	0.360	U	0.039	U	0.360	U	0.027	U	0.026	U	0.840	U	0.030	U	0.021	U	0.017	U
PCB-1254	11097-69-1	0.026	U	0.270	U	0.300	U	0.042	U	0.032	U	0.410	U	0.300	U	0.320	U	0.360	U	0.039	U	0.360	U	0.027	U	0.026	U	0.840	U	0.030	U	0.021	U	0.017	U
PCB-1260	11096-82-5	0.026	U	0.270	U	0.300	U	0.042	U	0.032	U	0.410	U	0.300	U	0.320	U	0.360	U	0.039	U	0.360	U	0.027	U	0.026	U	0.840	U	0.030	U	0.021	U	0.017	U
Metals by EPA Methods 6010/6020, 7471 (mg/kg)																																			
Chromium	7440-47-3	32		38		11		53		36		39		37		40		41		43		44		33		33		64		39		30		33	
Lead	7439-92-1	83		64		6		17		45		48		21		36		9		54		52		17		15		14		17		18		71	
Cadmium	7440-43-9	3.6		0.9		2	U	0.9	U	2.2	U	0.8		2.1	U	2.2	U	2.4	U	1.1		0.8		1.9	U	1.8	U	2.8	U	0.2	J	0.3	J	0.6	J
Silver	7440-22-4	1.7	U	1.9	U	2	U	2.9	U	2.2	U	2.7	U	2.1	U	2.2	U	2.42	U	2.7	U	2.5	U	1.9	U	1.8	U	2.8	U	0.2	J	0.2	J	1.3	
Arsenic	7440-38-2	12		10.4		9.1		11.4		12.8		16.1		11.8		13.5		12.4		17.6		15.3		9.1		9		14.6		7	J	8.9		13	
Selenium	7782-49-2	3.4	U	3.7	U	2	U	5.9	U	4.4	U	5.5	U	4.2	U	4.4	U	4.8	U	5.4	U	5	U	3.9	U	3.7	U	5.6	U	4	J	3	J	4	J
Barium	7440-39-3	103		101		32		163		115		130		99		101		116		120		122		98		102		86		110		110		120	
Mercury	7439-97-6	0.09	U	0.09	U	0.14		0.29		0.35		0.49		0.53		0.92		0.07		0.86		1		0.19		0.18		0.14		0.083	U	0.088	U	1.4	
Volatile Organic Compounds (VOCs) by EPA Method 8260																																			
VOCs	7440-47-3	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		NA		NA		NA	
Wet Chemistry (mg/kg)																																			
Total Phosphorus as P	14265-44-2	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		1500		540		910	
Nitrate-N	14797-55-8	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		3.0	U	2.7	U	2.2	U
Nitrite-N	14797-65-0	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		3.0	U	2.7	U	2.2	U
Total Kjeldahl Nitrogen (TKN)	DEP1013	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		5000		4200		1600	
Nitrogen, total	NITROGENTO	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		5000		4200		1600	
TOC	7440-44-0	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		68000		61000		53000	
Percent Solids (%)	--	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		32.8		37.1		45.4	

Table X.3-1
Summary of Sediment Sample Analytical Results
Feasbility Study
Oyster River Dam at Mill Pond
Durham, New Hampshire

Field Sample Data		SED-16		SED-DP		SED-17		SED-18	
Sample Date		06/23/2020		06/23/2020		06/23/2020		06/23/2020	
Sieve - Grain Description		0.1% G 39.5% S 60.5% F		N/A		0.2% G 46.9% S 52.8% F		0.7% G 47% S 52.3% F	
Analyte	CAS #	Result	QL (MDL)	Result	QL (MDL)	Result	QL (MDL)	Result	QL (MDL)
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA Method 8270/827									
Naphthalene	91-20-3	0.055		0.039		0.0060	J	0.012	
2-methylnaphthalene	91-57-6	0.035		0.025		0.0045	U	0.0050	J
Acenaphthylene	208-96-8	0.15		0.14		0.025		0.067	
Acenaphthene	83-32-9	0.017		0.015		0.0030	U	0.0027	U
Dibenzofuran	132-64-9	0.017		0.010	J	0.0034	U	0.0032	U
Fluorene	86-73-7	0.048		0.034		0.0019	U	0.0060	J
Phenanthrene	85-01-8	0.6		0.57		0.10		0.30	
Anthracene	120-12-7	0.14		0.13		0.028		0.084	
Fluoranthene	206-44-0	1.0		0.97		0.26		1.1	
Pyrene	129-00-0	0.94		0.94		0.27		0.95	
Benzo(a)anthracene	56-55-3	0.34		0.37		0.11		0.54	
Chrysene	218-01-9	0.50		0.52		0.14		0.56	
Benzo(b)fluoranthene	205-99-2	0.44		0.47		0.16		0.46	
Benzo(k)fluoranthene	207-08-9	0.44		0.46		0.13		0.42	
Benzo(a)pyrene	50-32-8	0.47		0.52		0.17		0.51	
Indeno(1,2,3-cd)pyrene	193-39-5	0.34		0.37		0.12		0.30	
Dibenzo(a,h)anthracene	53-70-3	0.11		0.13		0.039		0.11	
Benzo(g,h,i)perylene	191-24-2	0.38		0.41		0.13		0.27	
Pesticides by EPA Method 8081 (mg/kg)									
alpha-BHC	319-84-6	0.0083	U	0.008	U	0.0069	U	0.007	U
beta-BHC	319-85-7	0.011	U	0.011	U	0.0092	U	0.0093	U
delta-BHC	319-86-8	0.011	U	0.011	U	0.0092	U	0.0093	U
gamma-BHC (Lindane)	58-89-9	0.011	U	0.011	U	0.0092	U	0.0093	U
Heptachlor	76-44-8	0.011	U	0.011	U	0.0092	U	0.0093	U
Aldrin	309-00-2	0.014	U	0.013	U	0.012	U	0.012	U
Heptachlor Epoxide	1024-57-3	0.019	U	0.019	U	0.016	U	0.016	U
Endosulfan I	959-98-8	0.014	U	0.013	U	0.012	U	0.012	U
Dieldrin	60-57-1	0.014	U	0.013	U	0.012	U	0.012	U
4,4'-DDE	72-55-9	0.019	U	0.019	U	0.016	U	0.016	U
Endrin	72-20-8	0.019	U	0.019	U	0.016	U	0.016	U
Endosulfan II	33213-65-9	0.017	U	0.016	U	0.014	U	0.014	U
4,4'-DDD	72-54-8	0.017	U	0.020	J	0.014	U	0.014	U
Endosulfan Sulfate	1031-07-8	0.0083	U	0.008	U	0.0069	U	0.007	U
4,4'-DDT	50-29-3	0.017	U	0.016	U	0.014	U	0.014	U
Methoxychlor	72-43-5	0.031	U	0.029	U	0.025	U	0.025	U
Endrin Ketone	53494-70-5	0.019	U	0.019	U	0.016	U	0.016	U
Endrin Aldehyde	7421-93-4	0.042	U	0.040	U	0.035	U	0.035	U
Chlordane	57-74-9	NA		NA		NA		NA	
alpha-Chlordane	5103-71-9	0.014	U	0.013	U	0.012	U	0.012	U
gamma-Chlordane	5103-74-2	0.014	U	0.013	U	0.012	U	0.012	U
Toxaphene	8001-35-2	0.11	U	0.11	U	0.092	U	0.093	U
Polychlorinated Biphenols (PCBs) by EPA Method 8082 (mg/kg)									
PCB-1016	12674-11-2	0.023	U	0.026	U	0.020	U	0.018	U
PCB-1221	11104-28-2	0.023	U	0.026	U	0.020	U	0.018	U
PCB-1232	11141-16-5	0.023	U	0.026	U	0.020	U	0.018	U
PCB-1242	53469-21-9	0.023	U	0.026	U	0.020	U	0.018	U
PCB-1248	12672-29-6	0.023	U	0.026	U	0.020	U	0.018	U
PCB-1254	11097-69-1	0.023	U	0.026	U	0.020	U	0.018	U
PCB-1260	11096-82-5	0.023	U	0.026	U	0.020	U	0.018	U
Metals by EPA Methods 6010/6020, 7471 (mg/kg)									
Chromium	7440-47-3	32		37		73		76	
Lead	7439-92-1	59		68		43		44	
Cadmium	7440-43-9	0.7	J	2.1		0.1	J	0.1	J
Silver	7440-22-4	0.89		1.6		0.46		0.52	
Arsenic	7440-38-2	13		15		12		10	
Selenium	7782-49-2	4	J	4	J	2	J	3	J
Barium	7440-39-3	120		130		47		48	
Mercury	7439-97-6	1.1		1.2		0.33		0.47	
Volatile Organic Compounds (VOCs) by EPA Method 8260									
VOCs	7440-47-3	NA		NA		NA		NA	
Wet Chemistry (mg/kg)									
Total Phosphorus as P	14265-44-2	1100		1000		780		790	
Nitrate-N	14797-55-8	2.8	U	3	U	2.7	U	2.3	U
Nitrite-N	14797-65-0	2.8	U	3	U	2.7	U	2.3	U
Total Kjeldahl Nitrogen (TKN)	DEP1013	3400		3200		2500		2400	
Nitrogen, total	NITROGENTO	3400		3200		2500		2400	
TOC	7440-44-0	63000		65000		41000		59000	
Percent Solids (%)	--	35		35.1		39.4		30.5	

Table Notes:

1.) All concentrations are expressed in micrograms per kilogram (mg/kg), unless otherwise noted.

2.) "U" indicates target analyte not detected at a concentration greater than the quatitation limit (QL) shown. The QL for samples collected in 2009 represents the laboratory reporting limit (RL); the QL for the samples collected in 2020 represents the method detection limit (MDL).

3.) "J" indicates an estimated concentration.

Table X.3-2
Ecological Screening of Sediment Sample Analytical Results
Feasbility Study
Oyster River Dam at Mill Pond
Durham, New Hampshire

					Field Sample Data **Sample Date**	SED1 10/31/2009						SED2 10/30/2009						SED3 10/31/2009					
Analyte	CAS #	NHDES-Freshwater		ECO-Marine		HQ-TEC	HQ-PEC	Risk-Fresh	HQ-TEL	HQ-PEL	Risk-Marine	HQ-TEC	HQ-PEC	Risk-Fresh	HQ-TEL	HQ-PEL	Risk-Marine	HQ-TEC	HQ-PEC	Risk-Fresh	HQ-TEL	HQ-PEL	Risk-Marine
		TEC	PEC	TEL	PEL																		
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA Method 8270/8270 SIM (mg/kg)																							
Naphthalene	91-20-3	0.176	0.561	0.0346	0.391																		
2-methylnaphthalene	91-57-6	NS	NS	0.0202	0.201																		
Acenaphthylene	208-96-8	0.00587	0.128	0.00587	0.128																		
Acenaphthene	83-32-9	0.00671	0.0889	0.00671	0.0889																		
Fluorene	86-73-7	0.0774	0.536	0.0212	0.144																		
Phenanthrene	85-01-8	0.204	1.17	0.0867	0.544							4.2	0.7	Mod	9.8	1.6	High	5.4	0.9	Mod	12.7	2.0	High
Anthracene	120-12-7	0.0572	0.845	0.0469	0.245																		
Fluoranthene	206-44-0	0.423	2.23	0.113	1.494							3.6	0.7	Mod	13.5	1.0	High	5.2	1.0	Mod	19.6	1.5	High
Pyrene	129-00-0	0.195	1.52	0.153	1.398							6.8	0.9	Mod	8.7	1.0	Mod	10.1	1.3	High	12.9	1.4	High
Benzo(a)anthracene	56-55-3	0.108	1.05	0.0748	0.693							5.4	0.6	Mod	7.8	0.8	Mod	8.4	0.9	Mod	12.2	1.3	High
Chrysene	218-01-9	0.166	1.29	0.108	0.846							4.8	0.6	Mod	7.4	0.9	Mod	6.9	0.9	Mod	10.6	1.3	High
Benzo(b)fluoranthene	205-99-2	0.0272	13.4	0.13	1.107							39.0	0.1	Mod	8.2	1.0	Mod	56.6	0.1	Mod	11.8	1.4	High
Benzo(k)fluoranthene	207-08-9	0.0272	13.4	0.07	0.537													16.0	0.0	Mod	6.2	0.8	Mod
Benzo(a)pyrene	50-32-8	0.15	1.45	0.0888	0.763							4.4	0.5	Mod	7.4	0.9	Mod	6.6	0.7	Mod	11.2	1.3	High
Indeno(1,2,3-cd)pyrene	193-39-5	0.01732	0.33	0.068	0.488							40.3	2.1	High	10.3	1.4	High	52.0	2.7	High	13.3	1.8	High
Dibenzo(a,h)anthracene	53-70-3	0.033	0.1	0.00622	0.135													13.2	4.4	High	70.3	3.2	High
Benzo(g,h,i)perylene	191-24-2	0.17	0.3	0.067	0.497							2.7	1.5	High	6.8	0.9	Mod	3.6	2.1	High	9.2	1.2	High
Pesticides by EPA Method 8081 (mg/kg)																							
4,4'-DDD	72-54-8	0.00488	0.028	0.00122	0.00781																		
Metals by EPA Methods 6010/6020, 7471 (mg/kg)																							
Chromium	7440-47-3	43.4	111	52.3	160	0.7	0.3	Low	0.6	0.2	Low	0.9	0.3	Low	0.7	0.2	Low	0.3	0.1	Low	0.2	0.1	Low
Lead	7439-92-1	35.8	128	30.24	112	2.3	0.6	Mod	2.7	0.7	Mod	1.8	0.5	Mod	2.1	0.6	Mod	0.2	0.0	Low	0.2	0.1	Low
Cadmium	7440-43-9	0.99	4.98	0.68	4.21	3.6	0.7	Mod	5.3	0.9	Mod	0.9	0.2	Low	1.3	0.2	Mod						
Silver	7440-22-4	0.5	4.5	0.73	1.77																		
Arsenic	7440-38-2	9.79	33	7.24	41.6	1.2	0.4	Mod	1.7	0.3	Mod	1.1	0.3	Mod	1.4	0.3	Mod	0.9	0.3	Low	1.3	0.2	Mod
Barium	7440-39-3	20	60	130.1	48	5.2	1.7	High	0.8	2.1	High	5.1	1.7	High	0.8	2.1	High	1.6	0.5	Mod	0.2	0.7	Low
Mercury	7439-97-6	0.18	1.06	0.13	0.7													0.8	0.1	Low	1.1	0.2	Mod

Table X.3-2
Ecological Screening of Sediment Sample Analytical Results
Feasbility Study
Oyster River Dam at Mill Pond
Durham, New Hampshire

					Field Sample Data	SED4						SED5						SED6					
					Sample Date	10/31/2009						10/31/2009						10/31/2009					
Analyte	CAS #	NHDES-Freshwater TEC	PEC	ECO-Marine TEL	PEL	HQ-TEC	HQ-PEC	Risk-Fresh	HQ-TEL	HQ-PEL	Risk-Marine	HQ-TEC	HQ-PEC	Risk-Fresh	HQ-TEL	HQ-PEL	Risk-Marine	HQ-TEC	HQ-PEC	Risk-Fresh	HQ-TEL	HQ-PEL	Risk-Marine
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA Method 8270/8270 SIM (mg/kg)																							
Naphthalene	91-20-3	0.176	0.561	0.0346	0.391																		
2-methylnaphthalene	91-57-6	NS	NS	0.0202	0.201																		
Acenaphthylene	208-96-8	0.00587	0.128	0.00587	0.128																		
Acenaphthene	83-32-9	0.00671	0.0889	0.00671	0.0889																		
Fluorene	86-73-7	0.0774	0.536	0.0212	0.144																		
Phenanthrene	85-01-8	0.204	1.17	0.0867	0.544																		
Anthracene	120-12-7	0.0572	0.845	0.0469	0.245																		
Fluoranthene	206-44-0	0.423	2.23	0.113	1.494	1.5	0.3	Mod	5.7	0.4	Mod							2.9	0.5	Mod	10.8	0.8	Mod
Pyrene	129-00-0	0.195	1.52	0.153	1.398	3.0	0.4	Mod	3.8	0.4	Mod							5.6	0.7	Mod	7.2	0.8	Mod
Benzo(a)anthracene	56-55-3	0.108	1.05	0.0748	0.693																		
Chrysene	218-01-9	0.166	1.29	0.108	0.846													4.0	0.5	Mod	6.2	0.8	Mod
Benzo(b)fluoranthene	205-99-2	0.0272	13.4	0.13	1.107													34.7	0.1	Mod	7.3	0.9	Mod
Benzo(k)fluoranthene	207-08-9	0.0272	13.4	0.07	0.537																		
Benzo(a)pyrene	50-32-8	0.15	1.45	0.0888	0.763													4.1	0.4	Mod	6.9	0.8	Mod
Indeno(1,2,3-cd)pyrene	193-39-5	0.01732	0.33	0.068	0.488	34.8	1.8	High	8.9	1.2	High							46.5	2.4	High	11.9	1.7	High
Dibenzo(a,h)anthracene	53-70-3	0.033	0.1	0.00622	0.135																		
Benzo(g,h,i)perylene	191-24-2	0.17	0.3	0.067	0.497																		
Pesticides by EPA Method 8081 (mg/kg)																							
4,4'-DDD	72-54-8	0.00488	0.028	0.00122	0.00781																		
Metals by EPA Methods 6010/6020, 7471 (mg/kg)																							
Chromium	7440-47-3	43.4	111	52.3	160	1.2	0.5	Mod	1.0	0.3	Mod	0.8	0.3	Low	0.7	0.2	Low	0.9	0.4	Low	0.7	0.2	Low
Lead	7439-92-1	35.8	128	30.24	112	0.5	0.1	Low	0.6	0.2	Low	1.3	0.4	Mod	1.5	0.4	Mod	1.3	0.4	Mod	1.6	0.4	Mod
Cadmium	7440-43-9	0.99	4.98	0.68	4.21													0.8	0.2	Low	1.2	0.2	Mod
Silver	7440-22-4	0.5	4.5	0.73	1.77																		
Arsenic	7440-38-2	9.79	33	7.24	41.6	1.2	0.3	Mod	1.6	0.3	Mod	1.3	0.4	Mod	1.8	0.3	Mod	1.6	0.5	Mod	2.2	0.4	Mod
Barium	7440-39-3	20	60	130.1	48	8.2	2.7	High	1.3	3.4	High	5.8	1.9	High	0.9	2.4	High	6.5	2.2	High	1.0	2.7	High
Mercury	7439-97-6	0.18	1.06	0.13	0.7	1.6	0.3	Mod	2.2	0.4	Mod	1.9	0.3	Mod	2.7	0.5	Mod	2.7	0.5	Mod	3.8	0.7	Mod

Table X.3-2
Ecological Screening of Sediment Sample Analytical Results
Feasbility Study
Oyster River Dam at Mill Pond
Durham, New Hampshire

					Field Sample Data	SED7						SED8						SED9					
					Sample Date	10/31/2009						10/31/2009						10/31/2009					
Analyte	CAS #	NHDES-Freshwater TEC	PEC	ECO-Marine TEL	PEL	HQ-TEC	HQ-PEC	Risk-Fresh	HQ-TEL	HQ-PEL	Risk-Marine	HQ-TEC	HQ-PEC	Risk-Fresh	HQ-TEL	HQ-PEL	Risk-Marine	HQ-TEC	HQ-PEC	Risk-Fresh	HQ-TEL	HQ-PEL	Risk-Marine
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA Method 8270/8270 SIM (mg/kg)																							
Naphthalene	91-20-3	0.176	0.561	0.0346	0.391																		
2-methylnaphthalene	91-57-6	NS	NS	0.0202	0.201																		
Acenaphthylene	208-96-8	0.00587	0.128	0.00587	0.128																		
Acenaphthene	83-32-9	0.00671	0.0889	0.00671	0.0889																		
Fluorene	86-73-7	0.0774	0.536	0.0212	0.144																		
Phenanthrene	85-01-8	0.204	1.17	0.0867	0.544	2.3	0.4	Mod	5.3	0.9	Mod	3.1	0.5	Mod	7.2	1.1	High						
Anthracene	120-12-7	0.0572	0.845	0.0469	0.245																		
Fluoranthene	206-44-0	0.423	2.23	0.113	1.494	1.8	0.3	Mod	6.8	0.5	Mod	2.6	0.5	Mod	9.6	0.7	Mod						
Pyrene	129-00-0	0.195	1.52	0.153	1.398	3.7	0.5	Mod	4.8	0.5	Mod	5.4	0.7	Mod	6.9	0.8	Mod						
Benzo(a)anthracene	56-55-3	0.108	1.05	0.0748	0.693							4.0	0.4	Mod	5.8	0.6	Mod						
Chrysene	218-01-9	0.166	1.29	0.108	0.846	2.7	0.3	Mod	4.2	0.5	Mod	3.6	0.5	Mod	5.5	0.7	Mod						
Benzo(b)fluoranthene	205-99-2	0.0272	13.4	0.13	1.107	24.2	0.0	Mod	5.1	0.6	Mod	29.7	0.1	Mod	6.2	0.7	Mod						
Benzo(k)fluoranthene	207-08-9	0.0272	13.4	0.07	0.537																		
Benzo(a)pyrene	50-32-8	0.15	1.45	0.0888	0.763							3.4	0.4	Mod	5.8	0.7	Mod						
Indeno(1,2,3-cd)pyrene	193-39-5	0.01732	0.33	0.068	0.488	30.7	1.6	High	7.8	1.1	High	38.0	2.0	High	9.7	1.4	High						
Dibenzo(a,h)anthracene	53-70-3	0.033	0.1	0.00622	0.135																		
Benzo(g,h,i)perylene	191-24-2	0.17	0.3	0.067	0.497																		
Pesticides by EPA Method 8081 (mg/kg)																							
4,4'-DDD	72-54-8	0.00488	0.028	0.00122	0.00781																		
Metals by EPA Methods 6010/6020, 7471 (mg/kg)																							
Chromium	7440-47-3	43.4	111	52.3	160	0.9	0.3	Low	0.7	0.2	Low	0.9	0.4	Low	0.8	0.3	Low	0.9	0.4	Low	0.8	0.3	Low
Lead	7439-92-1	35.8	128	30.24	112	0.6	0.2	Low	0.7	0.2	Low	1.0	0.3	Mod	1.2	0.3	Mod	0.3	0.1	Low	0.3	0.1	Low
Cadmium	7440-43-9	0.99	4.98	0.68	4.21																		
Silver	7440-22-4	0.5	4.5	0.73	1.77																		
Arsenic	7440-38-2	9.79	33	7.24	41.6	1.2	0.4	Mod	1.6	0.3	Mod	1.4	0.4	Mod	1.9	0.3	Mod	1.3	0.4	Mod	1.7	0.3	Mod
Barium	7440-39-3	20	60	130.1	48	5.0	1.7	High	0.8	2.1	High	5.1	1.7	High	0.8	2.1	High	5.8	1.9	High	0.9	2.4	High
Mercury	7439-97-6	0.18	1.06	0.13	0.7	2.9	0.5	Mod	4.1	0.8	Mod	5.1	0.9	Mod	7.1	1.3	High	0.4	0.1	Low	0.5	0.1	Low

Table X.3-2
Ecological Screening of Sediment Sample Analytical Results
Feasbility Study
Oyster River Dam at Mill Pond
Durham, New Hampshire

					Field Sample Data **Sample Date**	SED10a 11/2/2009						SED10b 11/2/2009						SED11a 11/2/2009					
Analyte	CAS #	NHDES-Freshwater		ECO-Marine		HQ-TEC	HQ-PEC	Risk-Fresh	HQ-TEL	HQ-PEL	Risk-Marine	HQ-TEC	HQ-PEC	Risk-Fresh	HQ-TEL	HQ-PEL	Risk-Marine	HQ-TEC	HQ-PEC	Risk-Fresh	HQ-TEL	HQ-PEL	Risk-Marine
		TEC	PEC	TEL	PEL																		
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA Method 8270/8270 SIM (mg/kg)																							
Naphthalene	91-20-3	0.176	0.561	0.0346	0.391																		
2-methylnaphthalene	91-57-6	NS	NS	0.0202	0.201																		
Acenaphthylene	208-96-8	0.00587	0.128	0.00587	0.128																		
Acenaphthene	83-32-9	0.00671	0.0889	0.00671	0.0889																		
Fluorene	86-73-7	0.0774	0.536	0.0212	0.144																		
Phenanthrene	85-01-8	0.204	1.17	0.0867	0.544	3.1	0.5	Mod	7.3	1.2	High	2.5	0.4	Mod	5.9	0.9	Mod						
Anthracene	120-12-7	0.0572	0.845	0.0469	0.245																		
Fluoranthene	206-44-0	0.423	2.23	0.113	1.494	2.9	0.6	Mod	11.0	0.8	Mod	2.3	0.4	Mod	8.7	0.7	Mod						
Pyrene	129-00-0	0.195	1.52	0.153	1.398	5.8	0.8	Mod	7.5	0.8	Mod	4.6	0.6	Mod	5.9	0.6	Mod						
Benzo(a)anthracene	56-55-3	0.108	1.05	0.0748	0.693																		
Chrysene	218-01-9	0.166	1.29	0.108	0.846	4.1	0.5	Mod	6.2	0.8	Mod	3.3	0.4	Mod	5.1	0.6	Mod						
Benzo(b)fluoranthene	205-99-2	0.0272	13.4	0.13	1.107	36.1	0.1	Mod	7.6	0.9	Mod	29.7	0.1	Mod	6.2	0.7	Mod						
Benzo(k)fluoranthene	207-08-9	0.0272	13.4	0.07	0.537																		
Benzo(a)pyrene	50-32-8	0.15	1.45	0.0888	0.763	4.0	0.4	Mod	6.7	0.8	Mod												
Indeno(1,2,3-cd)pyrene	193-39-5	0.01732	0.33	0.068	0.488	44.3	2.3	High	11.3	1.6	High	38.4	2.0	High	9.8	1.4	High						
Dibenzo(a,h)anthracene	53-70-3	0.033	0.1	0.00622	0.135																		
Benzo(g,h,i)perylene	191-24-2	0.17	0.3	0.067	0.497																		
Pesticides by EPA Method 8081 (mg/kg)																							
4,4'-DDD	72-54-8	0.00488	0.028	0.00122	0.00781																		
Metals by EPA Methods 6010/6020, 7471 (mg/kg)																							
Chromium	7440-47-3	43.4	111	52.3	160	1.0	0.4	Low	0.8	0.3	Low	1.0	0.4	Mod	0.8	0.3	Low	0.8	0.3	Low	0.6	0.2	Low
Lead	7439-92-1	35.8	128	30.24	112	1.5	0.4	Mod	1.8	0.5	Mod	1.5	0.4	Mod	1.7	0.5	Mod	0.5	0.1	Low	0.6	0.2	Low
Cadmium	7440-43-9	0.99	4.98	0.68	4.21	1.1	0.2	Mod	1.6	0.3	Mod	0.8	0.2	Low	1.2	0.2	Mod						
Silver	7440-22-4	0.5	4.5	0.73	1.77																		
Arsenic	7440-38-2	9.79	33	7.24	41.6	1.8	0.5	Mod	2.4	0.4	Mod	1.6	0.5	Mod	2.1	0.4	Mod	0.9	0.3	Low	1.3	0.2	Mod
Barium	7440-39-3	20	60	130.1	48	6.0	2.0	High	0.9	2.5	High	6.1	2.0	High	0.9	2.5	High	4.9	1.6	High	0.8	2.0	High
Mercury	7439-97-6	0.18	1.06	0.13	0.7	4.8	0.8	Mod	6.6	1.2	High	5.6	0.9	Mod	7.7	1.4	High	1.1	0.2	Mod	1.5	0.3	Mod

Table X.3-2
Ecological Screening of Sediment Sample Analytical Results
Feasbility Study
Oyster River Dam at Mill Pond
Durham, New Hampshire

					Field Sample Data	SED11b						SED12						SED-13					
					Sample Date	11/2/2009						11/2/2009						06/23/2020					
Analyte	CAS #	NHDES-Freshwater TEC	PEC	ECO-Marine TEL	PEL	HQ-TEC	HQ-PEC	Risk-Fresh	HQ-TEL	HQ-PEL	Risk-Marine	HQ-TEC	HQ-PEC	Risk-Fresh	HQ-TEL	HQ-PEL	Risk-Marine	HQ-TEC	HQ-PEC	Risk-Fresh	HQ-TEL	HQ-PEL	Risk-Marine
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA Method 8270/8270 SIM (mg/kg)																							
Naphthalene	91-20-3	0.176	0.561	0.0346	0.391																		
2-methylnaphthalene	91-57-6	NS	NS	0.0202	0.201																		
Acenaphthylene	208-96-8	0.00587	0.128	0.00587	0.128													0.9	0.0	Low	0.9	0.0	Low
Acenaphthene	83-32-9	0.00671	0.0889	0.00671	0.0889																		
Fluorene	86-73-7	0.0774	0.536	0.0212	0.144																		
Phenanthrene	85-01-8	0.204	1.17	0.0867	0.544													0.1	0.0	Low	0.3	0.0	Low
Anthracene	120-12-7	0.0572	0.845	0.0469	0.245													0.1	0.0	Low	0.1	0.0	Low
Fluoranthene	206-44-0	0.423	2.23	0.113	1.494													0.1	0.0	Low	0.4	0.0	Low
Pyrene	129-00-0	0.195	1.52	0.153	1.398													0.2	0.0	Low	0.3	0.0	Low
Benzo(a)anthracene	56-55-3	0.108	1.05	0.0748	0.693													0.1	0.0	Low	0.1	0.0	Low
Chrysene	218-01-9	0.166	1.29	0.108	0.846													0.1	0.0	Low	0.1	0.0	Low
Benzo(b)fluoranthene	205-99-2	0.0272	13.4	0.13	1.107													0.6	0.0	Low	0.1	0.0	Low
Benzo(k)fluoranthene	207-08-9	0.0272	13.4	0.07	0.537													0.4	0.0	Low	0.1	0.0	Low
Benzo(a)pyrene	50-32-8	0.15	1.45	0.0888	0.763													0.2	0.0	Low	0.3	0.0	Low
Indeno(1,2,3-cd)pyrene	193-39-5	0.01732	0.33	0.068	0.488													0.8	0.0	Low	0.2	0.0	Low
Dibenzo(a,h)anthracene	53-70-3	0.033	0.1	0.00622	0.135													0.1	0.0	Low	0.3	0.0	Low
Benzo(g,h,i)perylene	191-24-2	0.17	0.3	0.067	0.497													0.1	0.0	Low	0.1	0.0	Low
Pesticides by EPA Method 8081 (mg/kg)																							
4,4'-DDD	72-54-8	0.00488	0.028	0.00122	0.00781																		
Metals by EPA Methods 6010/6020, 7471 (mg/kg)																							
Chromium	7440-47-3	43.4	111	52.3	160	0.8	0.3	Low	0.6	0.2	Low	1.5	0.6	Mod	1.2	0.4	Mod	0.9	0.4	Low	0.7	0.2	Low
Lead	7439-92-1	35.8	128	30.24	112	0.4	0.1	Low	0.5	0.1	Low	0.4	0.1	Low	0.5	0.1	Low	0.5	0.1	Low	0.6	0.2	Low
Cadmium	7440-43-9	0.99	4.98	0.68	4.21													0.2	0.0	Low	0.3	0.0	Low
Silver	7440-22-4	0.5	4.5	0.73	1.77													0.4	0.0	Low	0.3	0.1	Low
Arsenic	7440-38-2	9.79	33	7.24	41.6	0.9	0.3	Low	1.2	0.2	Mod	1.5	0.4	Mod	2.0	0.4	Mod	0.7	0.2	Low	1.0	0.2	Low
Barium	7440-39-3	20	60	130.1	48	5.1	1.7	High	0.8	2.1	High	4.3	1.4	High	0.7	1.8	High	5.5	1.8	High	0.8	2.3	High
Mercury	7439-97-6	0.18	1.06	0.13	0.7	1.0	0.2	Low	1.4	0.3	Mod	0.8	0.1	Low	1.1	0.2	Mod						

Table X.3-2
Ecological Screening of Sediment Sample Analytical Results
Feasbility Study
Oyster River Dam at Mill Pond
Durham, New Hampshire

				Field Sample Data		SED-14						SED-15						SED-16					
				Sample Date		06/23/2020						06/23/2020						06/23/2020					
Analyte	CAS #	NHDES-Freshwater		ECO-Marine		HQ-TEC	HQ-PEC	Risk-Fresh	HQ-TEL	HQ-PEL	Risk-Marine	HQ-TEC	HQ-PEC	Risk-Fresh	HQ-TEL	HQ-PEL	Risk-Marine	HQ-TEC	HQ-PEC	Risk-Fresh	HQ-TEL	HQ-PEL	Risk-Marine
		TEC	PEC	TEL	PEL																		
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA Method 8270/8270 SIM (mg/kg)																							
Naphthalene	91-20-3	0.176	0.561	0.0346	0.391							0.3	0.1	Low	1.4	0.1	Mod	0.3	0.1	Low	1.6	0.1	Mod
2-methylnaphthalene	91-57-6	NS	NS	0.0202	0.201										1.7	0.2	Mod				1.7	0.2	Mod
Acenaphthylene	208-96-8	0.00587	0.128	0.00587	0.128	2.7	0.1	Mod	2.7	0.1	Mod	29.0	1.3	High	29.0	1.3	High	25.6	1.2	High	25.6	1.2	High
Acenaphthene	83-32-9	0.00671	0.0889	0.00671	0.0889							3.4	0.3	Mod	3.4	0.3	Mod	2.5	0.2	Mod	2.5	0.2	Mod
Fluorene	86-73-7	0.0774	0.536	0.0212	0.144							0.7	0.1	Low	2.6	0.4	Mod	0.6	0.1	Low	2.3	0.3	Mod
Phenanthrene	85-01-8	0.204	1.17	0.0867	0.544	0.2	0.0	Low	0.4	0.1	Low	3.5	0.6	Mod	8.3	1.3	High	2.9	0.5	Mod	6.9	1.1	High
Anthracene	120-12-7	0.0572	0.845	0.0469	0.245	0.2	0.0	Low	0.2	0.0	Low	2.6	0.2	Mod	3.2	0.6	Mod	2.4	0.2	Mod	3.0	0.6	Mod
Fluoranthene	206-44-0	0.423	2.23	0.113	1.494	0.2	0.0	Low	0.7	0.1	Low	2.6	0.5	Mod	9.7	0.7	Mod	2.4	0.4	Mod	8.8	0.7	Mod
Pyrene	129-00-0	0.195	1.52	0.153	1.398	0.4	0.1	Low	0.5	0.1	Low	5.6	0.7	Mod	7.2	0.8	Mod	4.8	0.6	Mod	6.1	0.7	Mod
Benzo(a)anthracene	56-55-3	0.108	1.05	0.0748	0.693	0.4	0.0	Low	0.5	0.1	Low	3.7	0.4	Mod	5.3	0.6	Mod	3.1	0.3	Mod	4.5	0.5	Mod
Chrysene	218-01-9	0.166	1.29	0.108	0.846	0.3	0.0	Low	0.4	0.0	Low	3.3	0.4	Mod	5.1	0.7	Mod	3.0	0.4	Mod	4.6	0.6	Mod
Benzo(b)fluoranthene	205-99-2	0.0272	13.4	0.13	1.107	1.7	0.0	Mod	0.4	0.0	Low	18.0	0.0	Mod	3.8	0.4	Mod	16.2	0.0	Mod	3.4	0.4	Mod
Benzo(k)fluoranthene	207-08-9	0.0272	13.4	0.07	0.537	1.8	0.0	Mod	0.7	0.1	Low	17.6	0.0	Mod	6.9	0.9	Mod	16.2	0.0	Mod	6.3	0.8	Mod
Benzo(a)pyrene	50-32-8	0.15	1.45	0.0888	0.763	0.4	0.0	Low	0.7	0.1	Low	3.6	0.4	Mod	6.1	0.7	Mod	3.1	0.3	Mod	5.3	0.6	Mod
Indeno(1,2,3-cd)pyrene	193-39-5	0.01732	0.33	0.068	0.488	2.4	0.1	Mod	0.6	0.1	Low	21.9	1.2	High	5.6	0.8	Mod	19.6	1.0	High	5.0	0.7	Mod
Dibenzo(a,h)anthracene	53-70-3	0.033	0.1	0.00622	0.135	0.3	0.1	Low	1.6	0.1	Mod	3.6	1.2	High	19.3	0.9	Mod	3.3	1.1	High	17.7	0.8	Mod
Benzo(g,h,i)perylene	191-24-2	0.17	0.3	0.067	0.497	0.2	0.1	Low	0.6	0.1	Low	2.5	1.4	High	6.3	0.8	Mod	2.2	1.3	High	5.7	0.8	Mod
Pesticides by EPA Method 8081 (mg/kg)																							
4,4'-DDD	72-54-8	0.00488	0.028	0.00122	0.00781																		
Metals by EPA Methods 6010/6020, 7471 (mg/kg)																							
Chromium	7440-47-3	43.4	111	52.3	160	0.7	0.3	Low	0.6	0.2	Low	0.8	0.3	Low	0.6	0.2	Low	0.7	0.3	Low	0.6	0.2	Low
Lead	7439-92-1	35.8	128	30.24	112	0.5	0.1	Low	0.6	0.2	Low	2.0	0.6	Mod	2.3	0.6	Mod	1.6	0.5	Mod	2.0	0.5	Mod
Cadmium	7440-43-9	0.99	4.98	0.68	4.21	0.3	0.1	Low	0.4	0.1	Low	0.6	0.1	Low	0.9	0.1	Low	0.7	0.1	Low	1.0	0.2	Mod
Silver	7440-22-4	0.5	4.5	0.73	1.77	0.4	0.0	Low	0.3	0.1	Low	2.6	0.3	Mod	1.8	0.7	Mod	1.8	0.2	Mod	1.2	0.5	Mod
Arsenic	7440-38-2	9.79	33	7.24	41.6	0.9	0.3	Low	1.2	0.2	Mod	1.3	0.4	Mod	1.8	0.3	Mod	1.3	0.4	Mod	1.8	0.3	Mod
Barium	7440-39-3	20	60	130.1	48	5.5	1.8	High	0.8	2.3	High	6.0	2.0	High	0.9	2.5	High	6.0	2.0	High	0.9	2.5	High
Mercury	7439-97-6	0.18	1.06	0.13	0.7							7.8	1.3	High	10.8	2.0	High	6.1	1.0	High	8.5	1.6	High

Table X.3-2
Ecological Screening of Sediment Sample Analytical Results
Feasbility Study
Oyster River Dam at Mill Pond
Durham, New Hampshire

					Field Sample Data	SED-DP						SED-17						SED-18					
					Sample Date	06/23/2020						06/23/2020						06/23/2020					
Analyte	CAS #	NHDES-Freshwater		ECO-Marine		HQ-TEC	HQ-PEC	Risk-Fresh	HQ-TEL	HQ-PEL	Risk-Marine	HQ-TEC	HQ-PEC	Risk-Fresh	HQ-TEL	HQ-PEL	Risk-Marine	HQ-TEC	HQ-PEC	Risk-Fresh	HQ-TEL	HQ-PEL	Risk-Marine
		TEC	PEC	TEL	PEL																		
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA Method 8270/8270 SIM (mg/kg)																							
Naphthalene	91-20-3	0.176	0.561	0.0346	0.391	0.2	0.1	Low	1.1	0.1	Mod	0.0	0.0	Low	0.2	0.0	Low	0.1	0.0	Low	0.3	0.0	Low
2-methylnaphthalene	91-57-6	NS	NS	0.0202	0.201				1.2	0.1	Mod				0.2	0.0	Low				0.2	0.0	Low
Acenaphthylene	208-96-8	0.00587	0.128	0.00587	0.128	23.9	1.1	High	23.9	1.1	High	4.3	0.2	Mod	4.3	0.2	Mod	11.4	0.5	Mod	11.4	0.5	Mod
Acenaphthene	83-32-9	0.00671	0.0889	0.00671	0.0889	2.2	0.2	Mod	2.2	0.2	Mod												
Fluorene	86-73-7	0.0774	0.536	0.0212	0.144	0.4	0.1	Low	1.6	0.2	Mod							0.1	0.0	Low	0.3	0.0	Low
Phenanthrene	85-01-8	0.204	1.17	0.0867	0.544	2.8	0.5	Mod	6.6	1.0	High	0.5	0.1	Low	1.2	0.2	Mod	1.5	0.3	Mod	3.5	0.6	Mod
Anthracene	120-12-7	0.0572	0.845	0.0469	0.245	2.3	0.2	Mod	2.8	0.5	Mod	0.5	0.0	Low	0.6	0.1	Low	1.5	0.1	Mod	1.8	0.3	Mod
Fluoranthene	206-44-0	0.423	2.23	0.113	1.494	2.3	0.4	Mod	8.6	0.6	Mod	0.6	0.1	Low	2.3	0.2	Mod	2.6	0.5	Mod	9.7	0.7	Mod
Pyrene	129-00-0	0.195	1.52	0.153	1.398	4.8	0.6	Mod	6.1	0.7	Mod	1.4	0.2	Mod	1.8	0.2	Mod	4.9	0.6	Mod	6.2	0.7	Mod
Benzo(a)anthracene	56-55-3	0.108	1.05	0.0748	0.693	3.4	0.4	Mod	4.9	0.5	Mod	1.0	0.1	Mod	1.5	0.2	Mod	5.0	0.5	Mod	7.2	0.8	Mod
Chrysene	218-01-9	0.166	1.29	0.108	0.846	3.1	0.4	Mod	4.8	0.6	Mod	0.8	0.1	Low	1.3	0.2	Mod	3.4	0.4	Mod	5.2	0.7	Mod
Benzo(b)fluoranthene	205-99-2	0.0272	13.4	0.13	1.107	17.3	0.0	Mod	3.6	0.4	Mod	5.9	0.0	Mod	1.2	0.1	Mod	16.9	0.0	Mod	3.5	0.4	Mod
Benzo(k)fluoranthene	207-08-9	0.0272	13.4	0.07	0.537	16.9	0.0	Mod	6.6	0.9	Mod	4.8	0.0	Mod	1.9	0.2	Mod	15.4	0.0	Mod	6.0	0.8	Mod
Benzo(a)pyrene	50-32-8	0.15	1.45	0.0888	0.763	3.5	0.4	Mod	5.9	0.7	Mod	1.1	0.1	Mod	1.9	0.2	Mod	3.4	0.4	Mod	5.7	0.7	Mod
Indeno(1,2,3-cd)pyrene	193-39-5	0.01732	0.33	0.068	0.488	21.4	1.1	High	5.4	0.8	Mod	6.9	0.4	Mod	1.8	0.2	Mod	17.3	0.9	Mod	4.4	0.6	Mod
Dibenzo(a,h)anthracene	53-70-3	0.033	0.1	0.00622	0.135	3.9	1.3	High	20.9	1.0	Mod	1.2	0.4	Mod	6.3	0.3	Mod	3.3	1.1	High	17.7	0.8	Mod
Benzo(g,h,i)perylene	191-24-2	0.17	0.3	0.067	0.497	2.4	1.4	High	6.1	0.8	Mod	0.8	0.4	Low	1.9	0.3	Mod	1.6	0.9	Mod	4.0	0.5	Mod
Pesticides by EPA Method 8081 (mg/kg)																							
4,4'-DDD	72-54-8	0.00488	0.028	0.00122	0.00781	4.1	0.7	Mod	16.4	2.6	High												
Metals by EPA Methods 6010/6020, 7471 (mg/kg)																							
Chromium	7440-47-3	43.4	111	52.3	160	0.9	0.3	Low	0.7	0.2	Low	1.7	0.7	Mod	1.4	0.5	Mod	1.8	0.7	Mod	1.5	0.5	Mod
Lead	7439-92-1	35.8	128	30.24	112	1.9	0.5	Mod	2.2	0.6	Mod	1.2	0.3	Mod	1.4	0.4	Mod	1.2	0.3	Mod	1.5	0.4	Mod
Cadmium	7440-43-9	0.99	4.98	0.68	4.21	2.1	0.4	Mod	3.1	0.5	Mod	0.1	0.0	Low	0.1	0.0	Low	0.1	0.0	Low	0.1	0.0	Low
Silver	7440-22-4	0.5	4.5	0.73	1.77	3.2	0.4	Mod	2.2	0.9	Mod	0.9	0.1	Low	0.6	0.3	Low	1.0	0.1	Mod	0.7	0.3	Low
Arsenic	7440-38-2	9.79	33	7.24	41.6	1.5	0.5	Mod	2.1	0.4	Mod	1.2	0.4	Mod	1.7	0.3	Mod	1.0	0.3	Mod	1.4	0.2	Mod
Barium	7440-39-3	20	60	130.1	48	6.5	2.2	High	1.0	2.7	High	2.4	0.8	Mod	0.4	1.0	Low	2.4	0.8	Mod	0.4	1.0	Low
Mercury	7439-97-6	0.18	1.06	0.13	0.7	6.7	1.1	High	9.2	1.7	High	1.8	0.3	Mod	2.5	0.5	Mod	2.6	0.4	Mod	3.6	0.7	Mod

Table X.3-2
Ecological Screening of Sediment Sample Analytical Results
Feasbility Study
Oyster River Dam at Mill Pond
Durham, New Hampshire

		Field Sample Data **Sample Date**			
		NHDES-Freshwater		ECO-Marine	
Analyte	CAS #	TEC	PEC	TEL	PEL
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA Method 8270/8270 SIM (mg/kg)					
Naphthalene	91-20-3	0.176	0.561	0.0346	0.391
2-methylnaphthalene	91-57-6	NS	NS	0.0202	0.201
Acenaphthylene	208-96-8	0.00587	0.128	0.00587	0.128
Acenaphthene	83-32-9	0.00671	0.0889	0.00671	0.0889
Fluorene	86-73-7	0.0774	0.536	0.0212	0.144
Phenanthrene	85-01-8	0.204	1.17	0.0867	0.544
Anthracene	120-12-7	0.0572	0.845	0.0469	0.245
Fluoranthene	206-44-0	0.423	2.23	0.113	1.494
Pyrene	129-00-0	0.195	1.52	0.153	1.398
Benzo(a)anthracene	56-55-3	0.108	1.05	0.0748	0.693
Chrysene	218-01-9	0.166	1.29	0.108	0.846
Benzo(b)fluoranthene	205-99-2	0.0272	13.4	0.13	1.107
Benzo(k)fluoranthene	207-08-9	0.0272	13.4	0.07	0.537
Benzo(a)pyrene	50-32-8	0.15	1.45	0.0888	0.763
Indeno(1,2,3-cd)pyrene	193-39-5	0.01732	0.33	0.068	0.488
Dibenzo(a,h)anthracene	53-70-3	0.033	0.1	0.00622	0.135
Benzo(g,h,i)perylene	191-24-2	0.17	0.3	0.067	0.497
Pesticides by EPA Method 8081 (mg/kg)					
4,4'-DDD	72-54-8	0.00488	0.028	0.00122	0.00781
Metals by EPA Methods 6010/6020, 7471 (mg/kg)					
Chromium	7440-47-3	43.4	111	52.3	160
Lead	7439-92-1	35.8	128	30.24	112
Cadmium	7440-43-9	0.99	4.98	0.68	4.21
Silver	7440-22-4	0.5	4.5	0.73	1.77
Arsenic	7440-38-2	9.79	33	7.24	41.6
Barium	7440-39-3	20	60	130.1	48
Mercury	7439-97-6	0.18	1.06	0.13	0.7

Table Notes:

1.) All concentrations are expressed in micrograms per kilogram (mg/kg); only analytes detected in at least one sample are shown in the table.

2.) "U" indicates target analyte not detected at a concentration greater than the quatitation limit (QL) shown. The QL for samples collected in 2009 represents the laboratory reporting limit (RL); the QL for the samples collected in 2020 represents the method detection limit (MDL).

3.) "J" indicates an estimated concentration.

4.) "NA" indicates target analyte not analyzed during sampling event.

5.) New Hampshire Department of Environmental Services (NHDES) freshwater and marine screening thresholds were obtain from from a Draft NHDES Memorandum dated January 8, 2016 (Subject: Updated TEC and PEC sediment threshold) as provided to VHB via email on April 17, 2020:

"TEC" indicates threshold effect concentration;
"PEC" indicates probable effect concentration;
"TEL" indicates threshold effect level; and
"PEL" indicates probable effect level.

6.) Hazard quotients (HQs) were calculated for all detected constituents in each sample by dividing the constituent concentration by the screening threshold value. Based on the calculated HQs, each constituent was assigned a risk classification as follows:

- HQ-TEC (TEL) <1 was qualified as low risk;
- HQ-TEC (TEL) >1 was qualified as moderate (mod) risk; and

Table X.3-3
Human Health Screening of Sediment Sample Analytical Results
Feasbility Study
Oyster River Dam at Mill Pond
Durham, New Hampshire

		Field Sample Data	SED1		SED2		SED3		SED4		SED5		SED6		SED7		SED8		SED9		SED10a	
		Sample Date	10/31/2009		10/30/2009		10/31/2009		10/31/2009		10/31/2009		10/31/2009		10/31/2009		10/31/2009		10/31/2009		11/2/2009	
		Sieve - Grain Description	1% G 54% S 45% S/C		0% G 13% S 87% S/C		0.2% G 43% S 57% S/C		0% G 10% S 90% S/C		N/A		0% G 3% S 97% S/C		(0-2') 0.7% G; 29% S; 70% S/C (2-3') 0.5% G; 22% S 77% S/C		1% G 24% S 75% S/C		0.5% G 12% S 88% S/C		0.1% G 39% S 69% S/C	
Analyte	CAS #	NHDES S-1/SRS	Result	QL (RL)	Result	QL (RL)	Result	QL (RL)	Result	QL (RL)	Result	QL (RL)	Result	QL (RL)	Result	QL (RL)	Result	QL (RL)	Result	QL (RL)	Result	QL (RL)
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA Method 8270/8270 SIM (mg/kg)																						
Naphthalene	91-20-3	5	0.640	U	0.700	U	0.72	U	1.10	U	0.800	U	1.00	U	0.740	U	0.810	U	0.860	U	0.990	U
2-methylnaphthalene	91-57-6	96	0.640	U	0.700	U	0.72	U	1.10	U	0.800	U	1.00	U	0.740	U	0.810	U	0.860	U	0.990	U
Acenaphthylene	208-96-8	490	0.640	U	0.700	U	0.72	U	1.10	U	0.800	U	1.00	U	0.740	U	0.810	U	0.860	U	0.990	U
Acenaphthene	83-32-9	340	0.640	U	0.700	U	0.72	U	1.10	U	0.800	U	1.00	U	0.740	U	0.810	U	0.860	U	0.990	U
Dibenzofuran	132-64-9	NS	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Fluorene	86-73-7	77	0.640	U	0.700	U	0.72	U	1.10	U	0.800	U	1.00	U	0.740	U	0.810	U	0.860	U	0.990	U
Phenanthrene	85-01-8	NS	0.640	U	0.847		1.1		1.10	U	0.800	U	1.00	U	0.463	J	0.623	J	0.860	U	0.630	J
Anthracene	120-12-7	1000	0.640	U	0.700	U	0.72	U	1.10	U	0.800	U	1.00	U	0.740	U	0.81	U	0.860	U	0.990	U
Fluoranthene	206-44-0	960	0.640	U	1.53		2.21		0.639	J	0.800	U	1.22		0.774		1.09		0.860	U	1.24	
Pyrene	129-00-0	720	0.640	U	1.33		1.97		0.588	J	0.800	U	1.10		0.730	J	1.06		0.860	U	1.14	
Benzo(a)anthracene	56-55-3	1	0.640	U	0.583	J	0.91		1.10	U	0.800	U	1.00	U	0.740	U	0.434	J	0.860	U	0.990	U
Chrysene	218-01-9	120	0.640	U	0.798		1.14		1.10	U	0.800	U	0.668	J	0.451	J	0.593	J	0.860	U	0.673	J
Benzo(b)fluoranthene	205-99-2	1.0	0.640	U	1.06		1.54		1.10	U	0.800	U	0.945	J	0.658	J	0.809	J	0.860	U	0.983	J
Benzo(k)fluoranthene	207-08-9	12	0.640	U	0.799	U	0.434	J	1.10	U	0.800	U	1.00	U	0.740	U	0.810	U	0.860	U	0.990	U
Benzo(a)pyrene	50-32-8	0.7	0.640	U	0.661	J	0.992		1.10	U	0.800	U	0.616	J	0.740	U	0.516	J	0.860	U	0.594	J
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.640	U	0.698	J	0.901		0.602	J	0.800	U	0.806	J	0.532	J	0.659	J	0.860	U	0.767	J
Dibenzo(a,h)anthracene	53-70-3	0.7	0.640	U	0.700	U	0.437	J	1.10	U	0.800	U	1.00	U	0.740	U	0.810	U	0.860	U	0.990	U
Benzo(g,h,i)perylene	191-24-2	NS	0.640	U	0.453	J	0.617	J	1.10	U	0.800	U	1.00	U	0.740	U	0.810	U	0.860	U	0.990	U
Pesticides by EPA Method 8081 (mg/kg)																						
4,4'-DDD	72-54-8	6	0.017	U	0.180	U	0.200	U	0.028	U	0.021	U	0.270	U	0.200	U	0.210	U	0.240	U	0.026	U
Metals by EPA Methods 6010/6020, 7471 (mg/kg)																						
Chromium	7440-47-3	1000	32		38		11		53		36		39		37		40		41		43	
Lead	7439-92-1	400	83		64		6		17		45		48		21		36		9		54	
Cadmium	7440-43-9	33	3.6		0.9		2	U	0.9	U	2.2	U	0.8		2.1	U	2.2	U	2.4	U	1.1	
Silver	7440-22-4	89	1.7	U	1.9	U	2	U	2.9	U	2.2	U	2.7	U	2.1	U	2.2	U	2.42	U	2.7	U
Arsenic	7440-38-2	11	12		10.4		9.1		11.4		12.8		16.1		11.8		13.5		12.4		17.6	
Selenium	7782-49-2	180	3.4	U	3.7	U	2	U	5.9	U	4.4	U	5.5	U	4.2	U	4.4	U	4.8	U	5.4	U
Barium	7440-39-3	1000	103		101		32		163		115		130		99		101		116		120	
Mercury	7439-97-6	7	0.09	U	0.09	U	0.14		0.29		0.35		0.49		0.53		0.92		0.07		0.86	

Table X.3-3
Human Health Screening of Sediment Sample Analytical Results
Feasbility Study
Oyster River Dam at Mill Pond
Durham, New Hampshire

Field Sample Data **Sample Date**			SED10b 11/2/2009		SED11a 11/2/2009		SED11b 11/2/2009		SED12 11/2/2009		SED-13 06/23/2020		SED-14 06/23/2020		SED-15 06/23/2020		SED-16 06/23/2020		SED-DP 06/23/2020		SED-17 06/23/2020	
Sieve - Grain Description			N/A		0% G 10% S 90% S/C		N/A		33% G 30% S 35% S/C		0% G 42.7% S 57.3% F		0.1% G 58.9% S 41.1% F		0.1% G 28.4% S 71.5% F		0.1% G 39.5% S 60.5% F		N/A		0.2% G 46.9% S 52.8% F	
Analyte	CAS #	NHDES S-1/SRS	Result	QL (RL)	Result	QL (RL)	Result	QL (RL)	Result	QL (RL)	Result	QL (MDL)	Result	QL (MDL)	Result	QL (MDL)	Result	QL (MDL)	Result	QL (MDL)	Result	QL (MDL)
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA Method 8270/8270 SIM (mg/kg																						
Naphthalene	91-20-3	5	0.890	U	0.670	U	0.680	U	0.990	U	0.0064	U	0.0057	U	0.050		0.055		0.039		0.0060	J
2-methylnaphthalene	91-57-6	96	0.890	U	0.670	U	0.680	U	0.990	U	0.0053	U	0.0047	U	0.034		0.035		0.025		0.0045	U
Acenaphthylene	208-96-8	490	0.890	U	0.670	U	0.680	U	0.990	U	0.0050	J	0.016		0.17		0.15		0.14		0.025	
Acenaphthene	83-32-9	340	0.890	U	0.670	U	0.680	U	0.990	U	0.0035	U	0.0031	U	0.023		0.017		0.015		0.0030	U
Dibenzofuran	132-64-9	NS	NA		NA		NA		NA		0.0041	U	0.0036	U	0.021		0.017		0.010	J	0.0034	U
Fluorene	86-73-7	77	0.890	U	0.670	U	0.680	U	0.990	U	0.0022	U	0.0019	U	0.055		0.048		0.034		0.0019	U
Phenanthrene	85-01-8	NS	0.508	J	0.670	U	0.680	U	0.990	U	0.022		0.031		0.72		0.6		0.57		0.10	
Anthracene	120-12-7	1000	0.890	U	0.670	U	0.680	U	0.990	U	0.0030	J	0.010	J	0.15		0.14		0.13		0.028	
Fluoranthene	206-44-0	960	0.982		0.670	U	0.680	U	0.990	U	0.040		0.076		1.1		1.0		0.97		0.26	
Pyrene	129-00-0	720	0.901		0.670	U	0.680	U	0.990	U	0.040		0.079		1.1		0.94		0.94		0.27	
Benzo(a)anthracene	56-55-3	1	0.890	U	0.670	U	0.680	U	0.990	U	0.010	J	0.039		0.4		0.34		0.37		0.11	
Chrysene	218-01-9	120	0.546	J	0.670	U	0.680	U	0.990	U	0.015		0.042		0.55		0.50		0.52		0.14	
Benzo(b)fluoranthene	205-99-2	1.0	0.809	J	0.670	U	0.680	U	0.990	U	0.015		0.046		0.49		0.44		0.47		0.16	
Benzo(k)fluoranthene	207-08-9	12	0.890	U	0.670	U	0.680	U	0.990	U	0.010	J	0.048		0.48		0.44		0.46		0.13	
Benzo(a)pyrene	50-32-8	0.7	0.890	U	0.670	U	0.680	U	0.990	U	0.027		0.058		0.54		0.47		0.52		0.17	
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.665	J	0.670	U	0.680	U	0.990	U	0.014		0.041		0.38		0.34		0.37		0.12	
Dibenzo(a,h)anthracene	53-70-3	0.7	0.890	U	0.670	U	0.680	U	0.990	U	0.0020	J	0.010	J	0.12		0.11		0.13		0.039	
Benzo(g,h,i)perylene	191-24-2	NS	0.890	U	0.670	U	0.680	U	0.990	U	0.010	J	0.040		0.42		0.38		0.41		0.13	
Pesticides by EPA Method 8081 (mg/kg)																						
4,4'-DDD	72-54-8	6	0.240	U	0.018	U	0.017	U	0.560	U	0.017	U	0.015	U	0.012	U	0.017	U	0.020	J	0.014	U
Metals by EPA Methods 6010/6020, 7471 (mg/kg)																						
Chromium	7440-47-3	1000	44		33		33		64		39		30		33		32		37		73	
Lead	7439-92-1	400	52		17		15		14		17		18		71		59		68		43	
Cadmium	7440-43-9	33	0.8		1.9	U	1.8	U	2.8	U	0.2	J	0.3	J	0.6	J	0.7	J	2.1		0.1	J
Silver	7440-22-4	89	2.5	U	1.9	U	1.8	U	2.8	U	0.2	J	0.2	J	1.3		0.89		1.6		0.46	
Arsenic	7440-38-2	11	15.3		9.1		9		14.6		7	J	8.9		13		13		15		12	
Selenium	7782-49-2	180	5	U	3.9	U	3.7	U	5.6	U	4	J	3	J	4	J	4	J	4	J	2	J
Barium	7440-39-3	1000	122		98		102		86		110		110		120		120		130		47	
Mercury	7439-97-6	7	1		0.19		0.18		0.14		0.083	U	0.088	U	1.4		1.1		1.2		0.33	

Table X.3-3
Human Health Screening of Sediment Sample Analytical Results
Feasbility Study
Oyster River Dam at Mill Pond
Durham, New Hampshire

		Field Sample Data	SED-18	
		Sample Date	06/23/2020	
		Sieve - Grain Description	0.7% G 47% S 52.3% F	
Analyte	CAS #	NHDES S-1/SRS	Result	QL (MDL)
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA Method 8270/8270 SIM (mg/kg				
Naphthalene	91-20-3	5	0.012	
2-methylnaphthalene	91-57-6	96	0.0050	J
Acenaphthylene	208-96-8	490	0.067	
Acenaphthene	83-32-9	340	0.0027	U
Dibenzofuran	132-64-9	NS	0.0032	U
Fluorene	86-73-7	77	0.0060	J
Phenanthrene	85-01-8	NS	0.30	
Anthracene	120-12-7	1000	0.084	
Fluoranthene	206-44-0	960	1.1	
Pyrene	129-00-0	720	0.95	
Benzo(a)anthracene	56-55-3	1	0.54	
Chrysene	218-01-9	120	0.56	
Benzo(b)fluoranthene	205-99-2	1.0	0.46	
Benzo(k)fluoranthene	207-08-9	12	0.42	
Benzo(a)pyrene	50-32-8	0.7	0.51	
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.30	
Dibenzo(a,h)anthracene	53-70-3	0.7	0.11	
Benzo(g,h,i)perylene	191-24-2	NS	0.27	
Pesticides by EPA Method 8081 (mg/kg)				
4,4'-DDD	72-54-8	6	0.014	U
Metals by EPA Methods 6010/6020, 7471 (mg/kg)				
Chromium	7440-47-3	1000	76	
Lead	7439-92-1	400	44	
Cadmium	7440-43-9	33	0.1	J
Silver	7440-22-4	89	0.52	
Arsenic	7440-38-2	11	10	
Selenium	7782-49-2	180	3	J
Barium	7440-39-3	1000	48	
Mercury	7439-97-6	7	0.47	

Table Notes:

1.) All concentrations are expressed in micrograms per kilogram (mg/kg); only analytes detected in at least one sample are shown in the table.

2.) "U" indicates target analyte not detected at a concentration greater than the quatitation limit (QL) shown. The QL for samples collected in 2009 represents the laboratory reporting limit (RL); the QL for the samples collected in 2020 represents the method detection limit (MDL).

3.) "J" indicates an estimated concentration.

4.) "NA" indicates target analyte not analyzed during sampling event.

5.) "NHDES S-1/SRS" indicates New Hampshire Department of Environmental Services (NHDES) Contaminated Sites Risk Characterization and Management Policy (RCMP) Method 1 Soil Category S-1 Direct Contact Risk-based Concentrations, which are equivalent to the Soil Remediation Standards (SRS) established in the New Hampshire Code of Administrative Rules Chapter Env-Or 600, Contaminated Site Management.

6.) Detected concentrations that exceed NHDES S-1/SRS value are shaded orange.

7.) NHDES S-1/SRS for chromium III (CAS # 16065-83-1) was used for the purposes of this screening-level assessment.

Appendix D.4:
Laboratory Analytical Reports

R. W. Gillespie & Associates, Inc.
20 Pomerleau St., Suite 100, Biddeford, ME 04005 207-286-8008
177 Shattuck Way, Suite 1 West, Newington NH 03801 603-427-0244
44 Wood Avenue, Suite I, Mansfield, MA 508-623-0101

LETTER OF TRANSMITTAL

Date: December 19, 2019
Project No.: 1762-001
Attention: Aaron Dewees (aarond@absoluteresourceassociates.com)
Re:
Laboratory Testing
Miscellaneous Testing
Portsmouth, NH

Absolute Resource Associates
124 Heritage Ave. #16
Portsmouth, NH, 03801

We are sending you attached Laboratory Test Results.

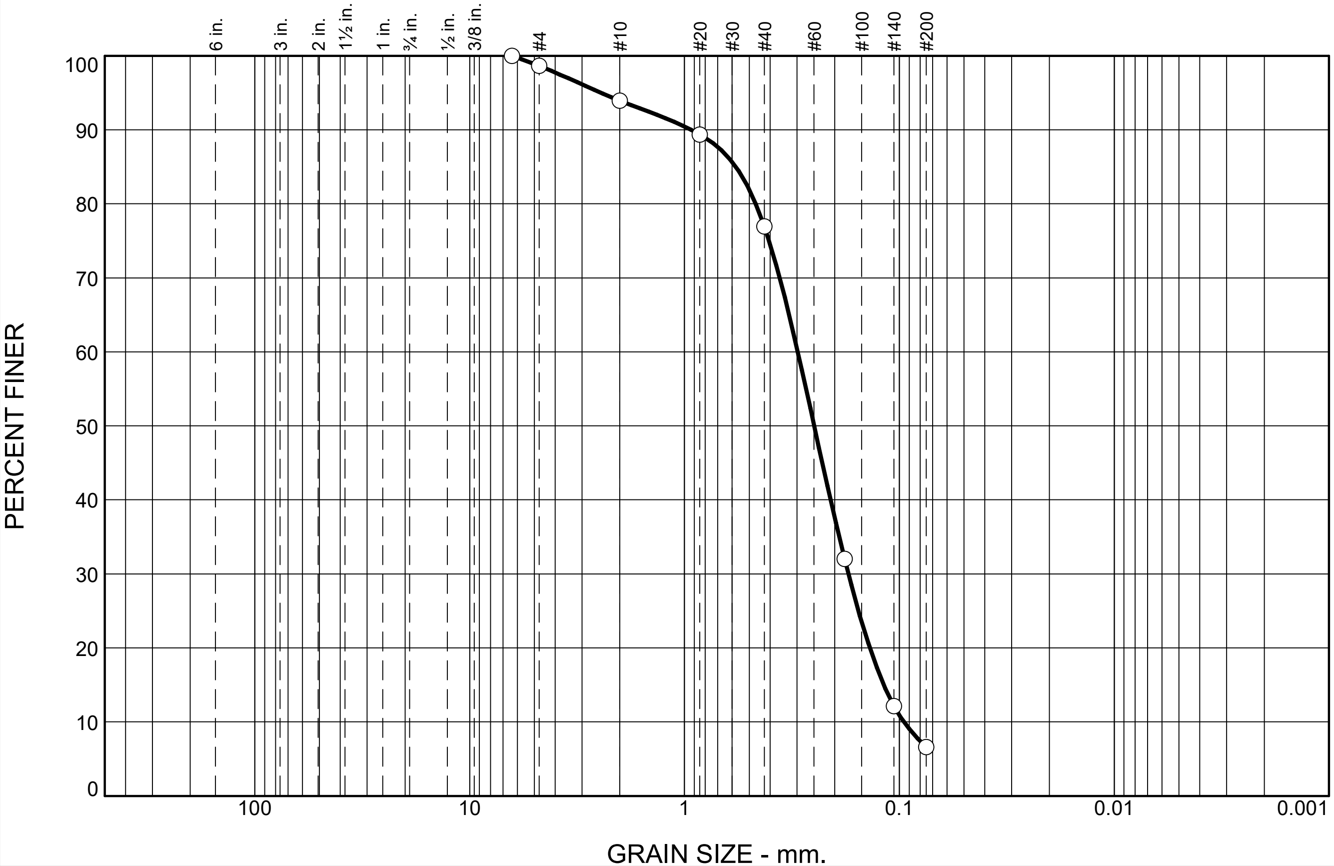
Laboratory No. (s)	Test (s) Performed
15852: HMB-1, Project 51422	Washed Gradation

Remarks:

Copy to: Charles Leahy(charlesl@absoluteresourceassociates.com)
Jane Stratton (janes@absoluteresourceassociates.com)

If enclosures are not noted, kindly notify us at once.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.4	4.7	17.0	70.3	6.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/4"	100.0		
#4	98.6		
#10	93.9		
#20	89.4		
#40	76.9		
#80	32.0		
#140	12.1		
#200	6.6		

* (no specification provided)

Soil Description

Project 51422 Soil Sample-poorly graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.9340 D_{85}= 0.5770 D_{60}= 0.2971
D_{50}= 0.2490 D_{30}= 0.1728 D_{15}= 0.1182
D_{10}= 0.0953 C_u= 3.12 C_c= 1.05

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Moisture Content: 200.8%

Location: HMB-1 Portsmouth, NH
Sample Number: 15852

Date: 12-17-2019

R.W. Gillespie
& Associates, Inc.
Biddeford, Maine

Client: Absolute Resourse Associates
Project: Miscellaneous Testing
Portsmouth, NH
Project No: 1762-001 **Lab No.** 15852

Unless a specific gravity test was explicitly requested, the values for specific gravity used are assumed values.

Tested By: JJB **Checked By:** MTG

MTG

PAGE 1 OF 1

Absolute Resource
associates

124 Heritage Avenue #16
Portsmouth, NH 03801
603-436-2001
absoluteresourceassociates.com

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

51422

Company Name: VHB

Company Address: 2 Bedford Farms Dr

Report To: Bill Arcieri

Phone #:

Invoice To:

☐ Email:

Project Name: Oyster River Mill Pond

Project #: 52633.00

Project Location: [✓ NH] MA ME VT ____ Other

Protocol: RCRA SDWA NPDES MCP NHDES OTHER

Reporting Limits: QAPP GW-1 S-1 EPA DW Other____

Quote #____ ☐ NH Reimbursement Pricing

PO #____

ANALYSIS REQUEST

Lab Sample ID (Lab Use Only)	Field ID	# CONTAINERS	Matrix: WATER	Matrix: SOLID	Matrix: OTHER	Preservation Method: HCl	Preservation Method: HNO_3	Preservation Method: H_2SO_4	Preservation Method: NaOH	Preservation Method: MeOH	Sampling: DATE	Sampling: TIME	Sampling: SAMPLER	☐ VOC 8260 ☐ VOC 8260 NHDES ☐ VOC 8260 MADEP	☐ VOC 624 ☐ VOC BTEX ☐ MtBE, only ☐ VOC 8021VT	☐ VPH MADEP ☐ MEGRO ☐ GRO 8015 ☐ 1,4-Dioxane	☐ VOC 524.2 ☐ VOC 524.2 NH List ☐ Gases-List:	☐ TPH ☐ DRO 8015 ☐ MEDRO ☐ EPH MADEP ☐ TPH Fingerprint	☐ 8270PAH ☐ 8270ABN ☐ 625 ☐ EDB 504.1	☐ 8082 PCB ☐ 8081 Pesticides ☐ 608 Pest/PCB	☐ O&G 1664 ☐ Mineral O&G SM5520F	☐ pH ☐ BOD ☐ Conductivity ☐ Turbidity	☐ TSS ☐ TDS ☐ TS ☐ TVS ☐ Alkalinity	☐ RCRA Metals ☐ Priority Pollutant Metals ☐ TAL Metals ☐ Hardness	☐ Total Metals-list:	☐ Dissolved Metals-list:	☐ Ammonia ☐ COD ☐ TKN ☐ TN ☐ TON ☐ TOC	☐ T-Phosphorus ☐ Phenols ☐ Bacteria P/A ☐ Bacteria MPN	☐ Cyanide ☐ Sulfide ☐ Nitrate + Nitrite ☐ Ortho P	☐ Nitrate ☐ Nitrite ☐ Chloride ☐ Sulfate ☐ Bromide ☐ Fluoride	☐ Corrosivity ☐ Reactive CN ☐ Reactive S- ☐ Ignitibility/FP	☐ TCLP Metals ☐ TCLP VOC ☐ TCLP SVOC ☐ TCLP Pesticide	Subcontract: ☒ Grain Size ☐ Herbicides ☐ Formaldehyde				Grab (G) or Composite (C)
51422 01	HMB - 1	1		\							11/26/19	2:48	PW																				X				

TAT REQUESTED

Priority (24 hr)* ☐

Expedited (48 hr)* ☐

Standard (10 Business Days) ☐

*Date Needed ____

See absoluteresourceassociates.com for sample acceptance policy and current accreditation lists.

SPECIAL INSTRUCTIONS

REPORTING INSTRUCTIONS ☐ PDF (e-mail address)____

☐ HARD COPY REQUIRED ☐ FAX (FAX#)____

RECEIVED ON ICE ☐ YES ☒ NO

TEMPERATURE 10 °C

CUSTODY RECORD

QSD-01 Revision 03/21/13

	Date	Time		Date	Time
Relinquished by Sampler:	12/4/19	3:00pM	Received by: Bill Arcieri	Dec 4	3:00pm
Relinquished by:			Received by:		
Relinquished by: Bill Arcieri			Received by Laboratory:	12/5/19	1125

eurofins
Environment Testing
America

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12
13

ANALYTICAL REPORT

Eurofins TestAmerica, Pittsburgh
301 Alpha Drive
RIDC Park
Pittsburgh, PA 15238
Tel: (412)963-7058

Laboratory Job ID: 180-107592-1
Client Project/Site: 53510

For:
Absolute Resource Associates
124 Heritage Ave
Unit 16
Portsmouth, New Hampshire 03801

Attn: Mr. Aaron DeWees

Authorized for release by:
7/10/2020 4:37:12 PM

Debra Bowen, Project Manager I
(412)963-2445
Debra.Bowen@Eurofinset.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

PA Lab ID: 02-00416

Table of Contents

Case Narrative

Client: Absolute Resource Associates
Project/Site: 53510

Job ID: 180-107592-1

Job ID: 180-107592-1

Laboratory: Eurofins TestAmerica, Pittsburgh

Narrative

Job Narrative
180-107592-1

Receipt

The samples were received on 6/25/2020 10:00 AM; the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 4.1° C.

GC Semi VOA

Please note that the reporting limit for Lloyd Kahn TOC analysis is a nominal value and does not reflect adjustments in sample mass processed on an individual basis

General Chemistry

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Accreditation/Certification Summary

Client: Absolute Resource Associates
Job ID: 180-107592-1
Project/Site: 53510

Laboratory: Eurofins TestAmerica, Pittsburgh

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
New Hampshire	NELAP	2030	04-05-21

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
2540G		Sediment	Percent Moisture
2540G		Sediment	Percent Solids

Sample Summary

Client: Absolute Resource Associates
Project/Site: 53510

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
180-107592-1	SED-13	Sediment	06/23/20 12:00	06/25/20 10:00	
180-107592-2	SED-16	Sediment	06/23/20 13:00	06/25/20 10:00	
180-107592-3	SED-DP	Sediment	06/23/20 12:50	06/25/20 10:00	
180-107592-4	SED-14	Sediment	06/23/20 11:00	06/25/20 10:00	
180-107592-5	SED-15	Sediment	06/23/20 10:00	06/25/20 10:00	
180-107592-6	SED-17	Sediment	06/23/20 16:00	06/25/20 10:00	
180-107592-7	SED-18	Sediment	06/23/20 15:00	06/25/20 10:00	

Method Summary

Client: Absolute Resource Associates
Project/Site: 53510

Job ID: 180-107592-1

Method	Method Description	Protocol	Laboratory
2540G	SM 2540G	SM22	TAL PIT
EPA-Lloyd Kahn	Organic Carbon, Total (TOC)	EPA	TAL PIT

Protocol References:

EPA = US Environmental Protection Agency

SM22 = Standard Methods For The Examination Of Water And Wastewater, 22nd Edition

Laboratory References:

TAL PIT = Eurofins TestAmerica, Pittsburgh, 301 Alpha Drive, RIDC Park, Pittsburgh, PA 15238, TEL (412)963-7058

Client Sample ID: SED-13

Lab Sample ID: 180-107592-1

Date Collected: 06/23/20 12:00

Matrix: Sediment

Date Received: 06/25/20 10:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	2540G		1			319981	06/30/20 07:23	MM1	TAL PIT

Instrument ID: NOEQUIP

Client Sample ID: SED-13

Lab Sample ID: 180-107592-1

Date Collected: 06/23/20 12:00

Matrix: Sediment

Date Received: 06/25/20 10:00

Percent Solids: 32.8

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA-Lloyd Kahn		1			320149	06/30/20 20:20	DLF	TAL PIT

Instrument ID: FLASHEA

Client Sample ID: SED-16

Lab Sample ID: 180-107592-2

Date Collected: 06/23/20 13:00

Matrix: Sediment

Date Received: 06/25/20 10:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	2540G		1			319981	06/30/20 07:23	MM1	TAL PIT

Instrument ID: NOEQUIP

Client Sample ID: SED-16

Lab Sample ID: 180-107592-2

Date Collected: 06/23/20 13:00

Matrix: Sediment

Date Received: 06/25/20 10:00

Percent Solids: 35.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA-Lloyd Kahn		1			320149	06/30/20 20:31	DLF	TAL PIT

Instrument ID: FLASHEA

Client Sample ID: SED-DP

Lab Sample ID: 180-107592-3

Date Collected: 06/23/20 12:50

Matrix: Sediment

Date Received: 06/25/20 10:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	2540G		1			319981	06/30/20 07:23	MM1	TAL PIT

Instrument ID: NOEQUIP

Client Sample ID: SED-DP

Lab Sample ID: 180-107592-3

Date Collected: 06/23/20 12:50

Matrix: Sediment

Date Received: 06/25/20 10:00

Percent Solids: 35.1

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA-Lloyd Kahn		1			320149	06/30/20 20:43	DLF	TAL PIT

Instrument ID: FLASHEA

Lab Chronicle

Client Sample ID: SED-14 **Lab Sample ID: 180-107592-4**
Date Collected: 06/23/20 11:00 **Matrix: Sediment**
Date Received: 06/25/20 10:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	2540G		1			319981	06/30/20 07:23	MM1	TAL PIT
	Instrument ID:	NOEQUIP								

Client Sample ID: SED-14 **Lab Sample ID: 180-107592-4**
Date Collected: 06/23/20 11:00 **Matrix: Sediment**
Date Received: 06/25/20 10:00 **Percent Solids: 37.1**

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA-Lloyd Kahn		1			320149	06/30/20 21:05	DLF	TAL PIT
	Instrument ID:	FLASHEA								

Client Sample ID: SED-15 **Lab Sample ID: 180-107592-5**
Date Collected: 06/23/20 10:00 **Matrix: Sediment**
Date Received: 06/25/20 10:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	2540G		1			319981	06/30/20 07:23	MM1	TAL PIT
	Instrument ID:	NOEQUIP								

Client Sample ID: SED-15 **Lab Sample ID: 180-107592-5**
Date Collected: 06/23/20 10:00 **Matrix: Sediment**
Date Received: 06/25/20 10:00 **Percent Solids: 45.4**

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA-Lloyd Kahn		1			320149	06/30/20 21:16	DLF	TAL PIT
	Instrument ID:	FLASHEA								

Client Sample ID: SED-17 **Lab Sample ID: 180-107592-6**
Date Collected: 06/23/20 16:00 **Matrix: Sediment**
Date Received: 06/25/20 10:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	2540G		1			319981	06/30/20 07:23	MM1	TAL PIT
	Instrument ID:	NOEQUIP								

Client Sample ID: SED-17 **Lab Sample ID: 180-107592-6**
Date Collected: 06/23/20 16:00 **Matrix: Sediment**
Date Received: 06/25/20 10:00 **Percent Solids: 39.4**

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA-Lloyd Kahn		1			320149	06/30/20 21:27	DLF	TAL PIT
	Instrument ID:	FLASHEA								

Lab Chronicle

Client: Absolute Resource Associates
Project/Site: 53510

Job ID: 180-107592-1

Client Sample ID: SED-18
Date Collected: 06/23/20 15:00
Date Received: 06/25/20 10:00

Lab Sample ID: 180-107592-7
Matrix: Sediment

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	2540G		1			319981	06/30/20 07:23	MM1	TAL PIT
	Instrument ID: NOEQUIP									

Client Sample ID: SED-18
Date Collected: 06/23/20 15:00
Date Received: 06/25/20 10:00

Lab Sample ID: 180-107592-7
Matrix: Sediment
Percent Solids: 30.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA-Lloyd Kahn		1			320149	06/30/20 21:38	DLF	TAL PIT
	Instrument ID: FLASHEA									

Laboratory References:

TAL PIT = Eurofins TestAmerica, Pittsburgh, 301 Alpha Drive, RIDC Park, Pittsburgh, PA 15238, TEL (412)963-7058

Analyst References:

Lab: TAL PIT
    Batch Type: Analysis
        DLF = Donald Ferguson
        MM1 = Mary Beth Miller

Client Sample ID: SED-13 Lab Sample ID: 180-107592-1

Date Collected: 06/23/20 12:00 **Matrix: Sediment**
Date Received: 06/25/20 10:00

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	67.2		0.1	0.1	%			06/30/20 07:23	1
Percent Solids	32.8		0.1	0.1	%			06/30/20 07:23	1

Client Sample ID: SED-13 Lab Sample ID: 180-107592-1

Date Collected: 06/23/20 12:00 **Matrix: Sediment**
Date Received: 06/25/20 10:00 **Percent Solids: 32.8**

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon - Duplicates	68000		3000	2300	mg/Kg	☼		06/30/20 20:20	1

Client Sample ID: SED-16 Lab Sample ID: 180-107592-2

Date Collected: 06/23/20 13:00 **Matrix: Sediment**
Date Received: 06/25/20 10:00

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	65.0		0.1	0.1	%			06/30/20 07:23	1
Percent Solids	35.0		0.1	0.1	%			06/30/20 07:23	1

Client Sample ID: SED-16 Lab Sample ID: 180-107592-2

Date Collected: 06/23/20 13:00 **Matrix: Sediment**
Date Received: 06/25/20 10:00 **Percent Solids: 35.0**

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon - Duplicates	63000		2900	2100	mg/Kg	☼		06/30/20 20:31	1

Client Sample ID: SED-DP Lab Sample ID: 180-107592-3

Date Collected: 06/23/20 12:50 **Matrix: Sediment**
Date Received: 06/25/20 10:00

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	64.9		0.1	0.1	%			06/30/20 07:23	1
Percent Solids	35.1		0.1	0.1	%			06/30/20 07:23	1

Client Sample ID: SED-DP Lab Sample ID: 180-107592-3

Date Collected: 06/23/20 12:50 **Matrix: Sediment**
Date Received: 06/25/20 10:00 **Percent Solids: 35.1**

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon - Duplicates	65000		2800	2100	mg/Kg	☼		06/30/20 20:43	1

Client Sample ID: SED-14 Lab Sample ID: 180-107592-4

Date Collected: 06/23/20 11:00 **Matrix: Sediment**
Date Received: 06/25/20 10:00

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	62.9		0.1	0.1	%			06/30/20 07:23	1

Client Sample ID: SED-14

Lab Sample ID: 180-107592-4
Date Collected: 06/23/20 11:00
Matrix: Sediment
Date Received: 06/25/20 10:00

General Chemistry (Continued)

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	37.1		0.1	0.1	%			06/30/20 07:23	1

Client Sample ID: SED-14

Lab Sample ID: 180-107592-4
Date Collected: 06/23/20 11:00
Matrix: Sediment
Date Received: 06/25/20 10:00
Percent Solids: 37.1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon - Duplicates	61000		2700	2000	mg/Kg	☼		06/30/20 21:05	1

Client Sample ID: SED-15

Lab Sample ID: 180-107592-5
Date Collected: 06/23/20 10:00
Matrix: Sediment
Date Received: 06/25/20 10:00

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	54.6		0.1	0.1	%			06/30/20 07:23	1
Percent Solids	45.4		0.1	0.1	%			06/30/20 07:23	1

Client Sample ID: SED-15

Lab Sample ID: 180-107592-5
Date Collected: 06/23/20 10:00
Matrix: Sediment
Date Received: 06/25/20 10:00
Percent Solids: 45.4

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon - Duplicates	53000		2200	1600	mg/Kg	☼		06/30/20 21:16	1

Client Sample ID: SED-17

Lab Sample ID: 180-107592-6
Date Collected: 06/23/20 16:00
Matrix: Sediment
Date Received: 06/25/20 10:00

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	60.6		0.1	0.1	%			06/30/20 07:23	1
Percent Solids	39.4		0.1	0.1	%			06/30/20 07:23	1

Client Sample ID: SED-17

Lab Sample ID: 180-107592-6
Date Collected: 06/23/20 16:00
Matrix: Sediment
Date Received: 06/25/20 10:00
Percent Solids: 39.4

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon - Duplicates	41000		2500	1900	mg/Kg	☼		06/30/20 21:27	1

Client Sample ID: SED-18

Lab Sample ID: 180-107592-7
Date Collected: 06/23/20 15:00
Matrix: Sediment
Date Received: 06/25/20 10:00

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	69.5		0.1	0.1	%			06/30/20 07:23	1
Percent Solids	30.5		0.1	0.1	%			06/30/20 07:23	1

Client Sample Results

Client Sample ID: SED-18
Date Collected: 06/23/20 15:00
Date Received: 06/25/20 10:00

Lab Sample ID: 180-107592-7
Matrix: Sediment
Percent Solids: 30.5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon - Duplicates	**59000**		3300	2400	mg/Kg	☼		06/30/20 21:38	1

QC Sample Results

Method: EPA-Lloyd Kahn - Organic Carbon, Total (TOC)

Lab Sample ID: MB 180-320149/4
Matrix: Sediment
Analysis Batch: 320149

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon - Duplicates	ND		1000	750	mg/Kg			06/30/20 16:59	1

Lab Sample ID: LCS 180-320149/5
Matrix: Sediment
Analysis Batch: 320149

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Total Organic Carbon - Duplicates			37800	42800		mg/Kg		113	75 - 125		

General Chemistry

Analysis Batch: 319981

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-107592-1	SED-13	Total/NA	Sediment	2540G	
180-107592-2	SED-16	Total/NA	Sediment	2540G	
180-107592-3	SED-DP	Total/NA	Sediment	2540G	
180-107592-4	SED-14	Total/NA	Sediment	2540G	
180-107592-5	SED-15	Total/NA	Sediment	2540G	
180-107592-6	SED-17	Total/NA	Sediment	2540G	
180-107592-7	SED-18	Total/NA	Sediment	2540G	

Analysis Batch: 320149

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-107592-1	SED-13	Total/NA	Sediment	EPA-Lloyd Kahn	
180-107592-2	SED-16	Total/NA	Sediment	EPA-Lloyd Kahn	
180-107592-3	SED-DP	Total/NA	Sediment	EPA-Lloyd Kahn	
180-107592-4	SED-14	Total/NA	Sediment	EPA-Lloyd Kahn	
180-107592-5	SED-15	Total/NA	Sediment	EPA-Lloyd Kahn	
180-107592-6	SED-17	Total/NA	Sediment	EPA-Lloyd Kahn	
180-107592-7	SED-18	Total/NA	Sediment	EPA-Lloyd Kahn	
MB 180-320149/4	Method Blank	Total/NA	Sediment	EPA-Lloyd Kahn	
LCS 180-320149/5	Lab Control Sample	Total/NA	Sediment	EPA-Lloyd Kahn	

Absolute Resource
associates

SUBCONTRACT CHAIN OF CUSTODY DOCUMENTATION

Client: Absolute Resource Associates	Contact: Aaron DeWees	Phone: 603-436-2001	Fax:		Page 1 of 1
Report to: Aaron DeWees/Charles Leahy	Address: 124 Heritage Ave, #16		Project Name/Number: 53510		
Invoice to: cathyd@absoluteresourceassociates.com	Portsmouth, NH 03801		Project State: NH MA ME VT		
PO#: 53510 Quote #:			Protocol: RCRA SDWA NPDES MCP NHDES Other		

Lab Number: (assigned by laboratory)	Field ID: (must agree with container)	Date Sampled	Time Sampled	Sampled By	Container Size (mL)	Container Type (P/G/T)	Field Preservation	Matrix S=Soil W=Water	Analyses Requested: Special Instructions:
	SED-13	6/23	1200	AR	4oz jar	G	None	S	TOC
	SED-16		1300						
	SED-DP		12:50						
	SED-14		1100						
	SED-15		1000						
	SED-17		1600						
	SED-18		1500						

180-107592 Chain of Custody

Subcontract Laboratory: TA-Pittsburgh

Relinquished by: Nathaniel Jomai	Date: 6/24/20	Time: 14:32	Received by: UPS	Date: 6/24/20	Time: 14:32
Relinquished by:	Date:	Time:	Received by: Lmar	Date: 6/25/20	Time: 1000
Relinquished by:	Date:	Time:	Received by:	Date:	Time:

Reporting Instructions: PDF (Email Address: aarond@absoluteresourceassociates.com; charlesl@absoluteresourceassociates.com)

Excel File: Y / N

Received on ice? [✓ Y] N

Temp:

TAT Requested: Priority (24hr) Expedited (48hr) 10 Business days Date needed:

Comments:

QSD-21 12/10/19 Rev2 ajd (pg 1/1)

Login Sample Receipt Checklist

Client: Absolute Resource Associates

Job Number: 180-107592-1

Login Number: 107592
List Number: 1
Creator: Say, Thomas C

List Source: Eurofins TestAmerica, Pittsburgh

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

PAGE ____ OF __

Absolute Resource associates

124 Heritage Avenue #16
Portsmouth, NH 03801
603-436-2001
absoluteresourceassociates.com

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

53510

Company Name: VHB
Company Address: 2 Bedford Farm Drive, Bedford, NH
Report To: Rene Nahlik
Phone #: 603-391-3993
Invoice to:
Email: Rnahlik@vhb.com
PO #:

Project Name: Mill Pond
Project #: 52633
Project Location: [✓ NH] MA ME VT ______
Accreditation Required? N/Y: ______
Protocol: RCRA SDWA NPDES MCP NHDES DOD
Reporting Limits: QAPP GW-1 S-1 EPA DW Other______
Quote # ______
☐ NH Reimbursement Pricing

			Matrix			Preservation Method					Sampling		
Lab Sample ID (Lab Use Only)	Field ID	# CONTAINERS	WATER	SOLID	OTHER	HCl	HNO_3	H_2SO_4	NaOH	MeOH	DATE	TIME	SAMPLER
53510-01	SED-13	5		X							6/23/20	1200	AR
-02	SED-16	5		X								1300	AR
-02MS	SED-16 MS	3		X								1300	AR
-02MSD	SED-16 MSD	3		X								1300	AR
-03	SED-DP	4		X								1250	AR
-04	SED-14	5		X								1100	AR
-05	SED-15	5		X								1000	AR
-06	SED-17	5		X								1600	AR
-07	SED-18	5		X								1500	AR
-08	SED-FB	2	X				X					1630	AR

ANALYSIS REQUEST

Field ID	☐ VOC 8260 ☐ VOC 8260 NHDES ☐ VOC 8260 MADEP	☐ VOC 624.1 ☐ VOC BTEX MtBE, only ☐ VOC 8021VT	☐ VPH MADEP ☐ GRO 8015 ☐ 1,4-Dioxane	☐ VOC 524.2 ☐ VOC 524.2 NH List ☐ Gases-List:	☐ TPH ☐ DRO 8015 ☐ EPH MADEP ☐ TPH Fingerprint	☒ 8270PAH ☐ 8270ABN ☐ 625.1 ☐ EDB SIM	☒ 8082 PCB ☒ 8081 Pesticides ☐ 608.3 Pest/PCB	☐ PFAS 537.1	☐ O&G 1664 ☐ Mineral O&G 1664	☐ pH ☐ BOD ☐ Conductivity ☐ Turbidity ☐ Apparent Color	☐ TSS ☐ TDS ☐ TS ☐ TVS ☐ Alkalinity ☐ Acidity	☒ RCRA Metals ☐ Priority Pollutant Metals ☐ TAL Metals ☐ Hardness	☐ Total Metals-list:	☐ Dissolved Metals-list:	☐ Ammonia ☐ COD ☐ TKN ☐ TN ☐ TON ☒ TOC ☐ Ferrous Iron	☒ T-Phosphorus ☐ Bacteria P/A ☐ Bacteria MPN ☐ Enterococci	☐ Cyanide ☐ Sulfide ☐ Nitrate + Nitrite ☐ Ortho P ☐ Phenols	☐ Nitrate ☐ Nitrite ☐ Chloride ☐ Sulfate ☐ Bromide ☐ Fluoride	☐ Corrosivity ☐ Ignitibility/FP	☐ TCLP Metals ☐ TCLP VOC ☐ TCLP SVOC ☐ TCLP Pesticide	Subcontract: ☒ Grain Size ☐ Herbicides ☐ Asbestos	Total Nitrogen	Matrix Spike/Matrix Spike Dup	Grab (G) or Composite (C)
SED-13						X	X					X			X	X					X	X		C
SED-16						X	X					X			X	X					X	X		C
SED-16 MS						X	X					X											X	C
SED-16 MSD						X	X					X											X	C
SED-DP						X	X					X			X	X						X		C
SED-14						X	X					X			X	X					X	X		C
SED-15						X	X					X			X	X					X	X		C
SED-17						X	X					X			X	X					X	X		C
SED-18						X	X					X			X	X					X	X		C
SED-FB						X						X												

TAT REQUESTED
Priority (24 hr)* ☐
Expedited (48 hr)* ☐
Standard ☒
(10 Business Days)
*Date Needed______

See absoluteresourceassociates.com for sample acceptance policy and current accreditation lists.

SPECIAL INSTRUCTIONS

REPORTING INSTRUCTIONS ☐ PDF (e-mail address)______
☐ HARD COPY REQUIRED ☐ EDD______

RECEIVED ON ICE ☒ YES ☐ NO
TEMPERATURE 10 °C

CUSTODY RECORD

Relinquished by Sampler:	Date 6/23	Time 1700	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by Laboratory:	Date 6/23/20	Time 1700

QSD-01 Revision 03/09/2020

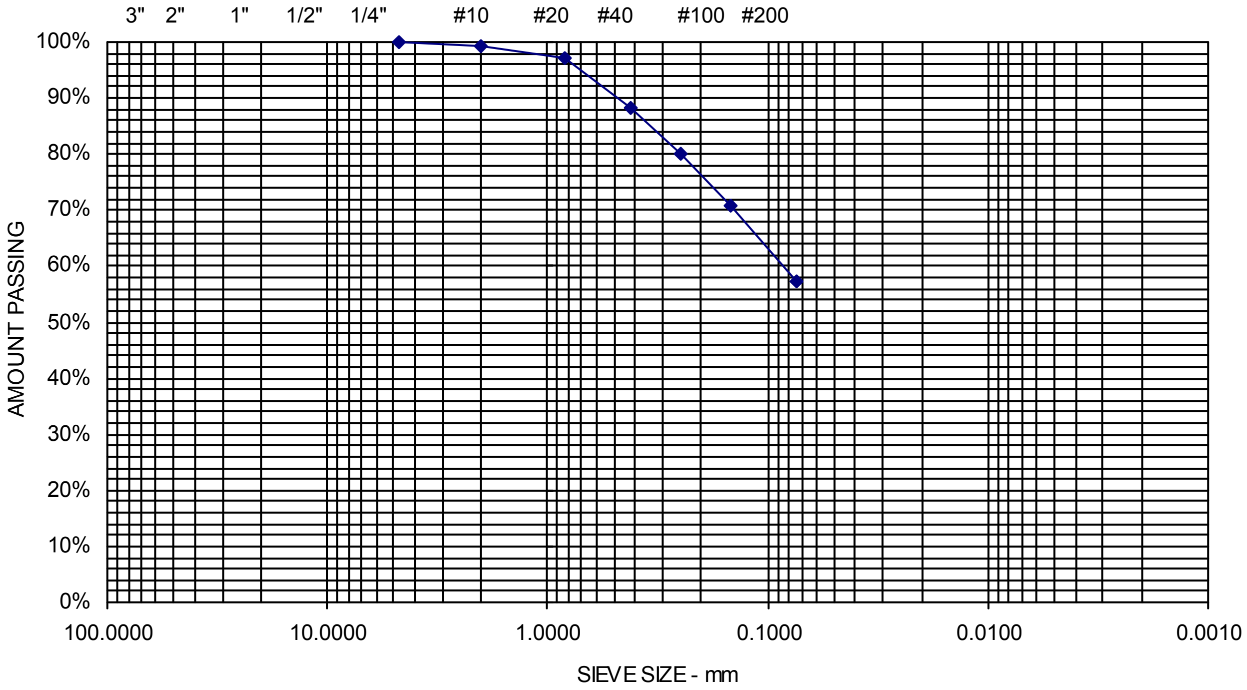
S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

Project Name	PORTSMOUTH NH - ARA PROJECT 53510 - LAB TESTING	Project Number	20-0893
		Lab ID	19870S
Client	ABSOLUTE RESOURCE ASSOCIATES	Date Received	7/1/2020
Exploration	**6/23 - 12:00**	Date Completed	7/13/2020
Material Source	**SED - 13**	Tested By	BRADLEY GERSCHWILER

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
4.75 mm	**No. 4**	**100**	0% Gravel
2.00 mm	**No. 10**	**99**	
850 um	**No. 20**	**97**	
425 um	**No. 40**	**88**	42.7% Sand
250 um	**No. 60**	**80**	
150 um	**No. 100**	**71**	
75 um	**No. 200**	**57.3**	57.3% Fines



Comments:

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S.W.COLE
ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

Project Name PORTSMOUTH NH - ARA PROJECT 53510 - LAB TESTING

Client ABSOLUTE RESOURCE ASSOCIATES

Exploration **6/23 - 11:00**

Material Source **SED - 14**

Project Number 20-0893

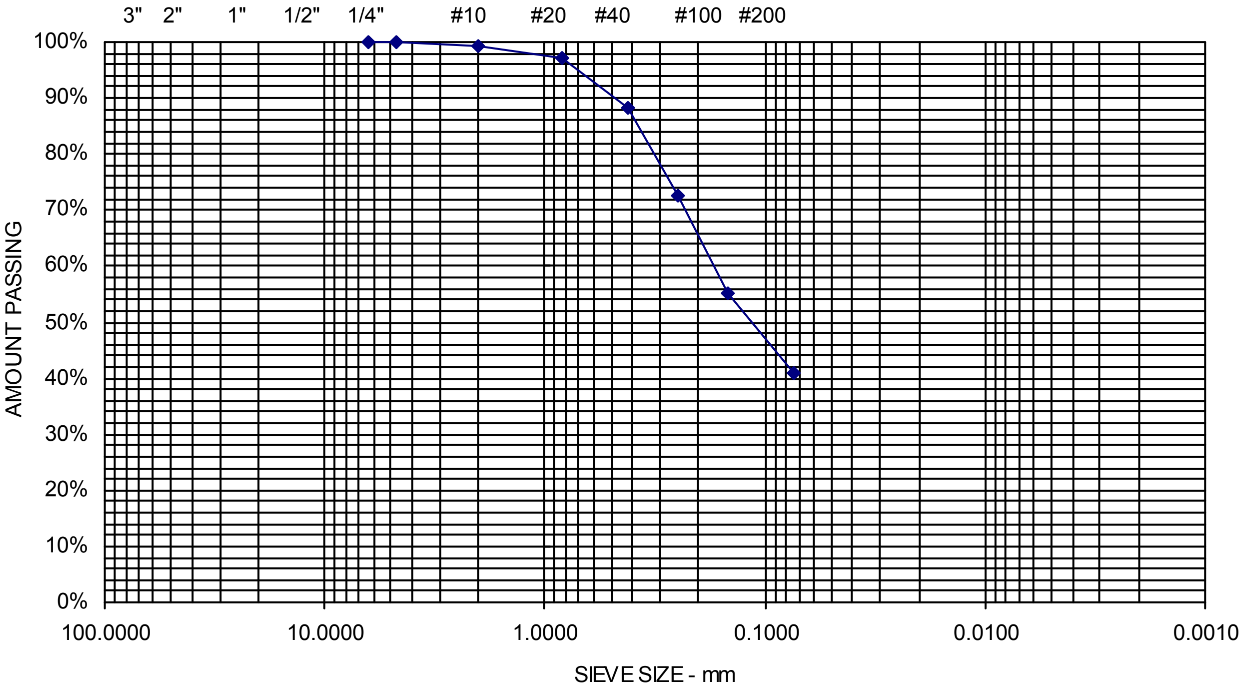
Lab ID 19871S

Date Received 7/1/2020

Date Completed 7/13/2020

Tested By BRADLEY GERSCHWILER

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
6.3 mm	**1/4"**	**100**	
4.75 mm	**No. 4**	**100**	0.1% Gravel
2.00 mm	**No. 10**	**99**	
850 um	**No. 20**	**97**	
425 um	**No. 40**	**88**	58.9% Sand
250 um	**No. 60**	**72**	
150 um	**No. 100**	**55**	
75 um	**No. 200**	**41.1**	41.1% Fines



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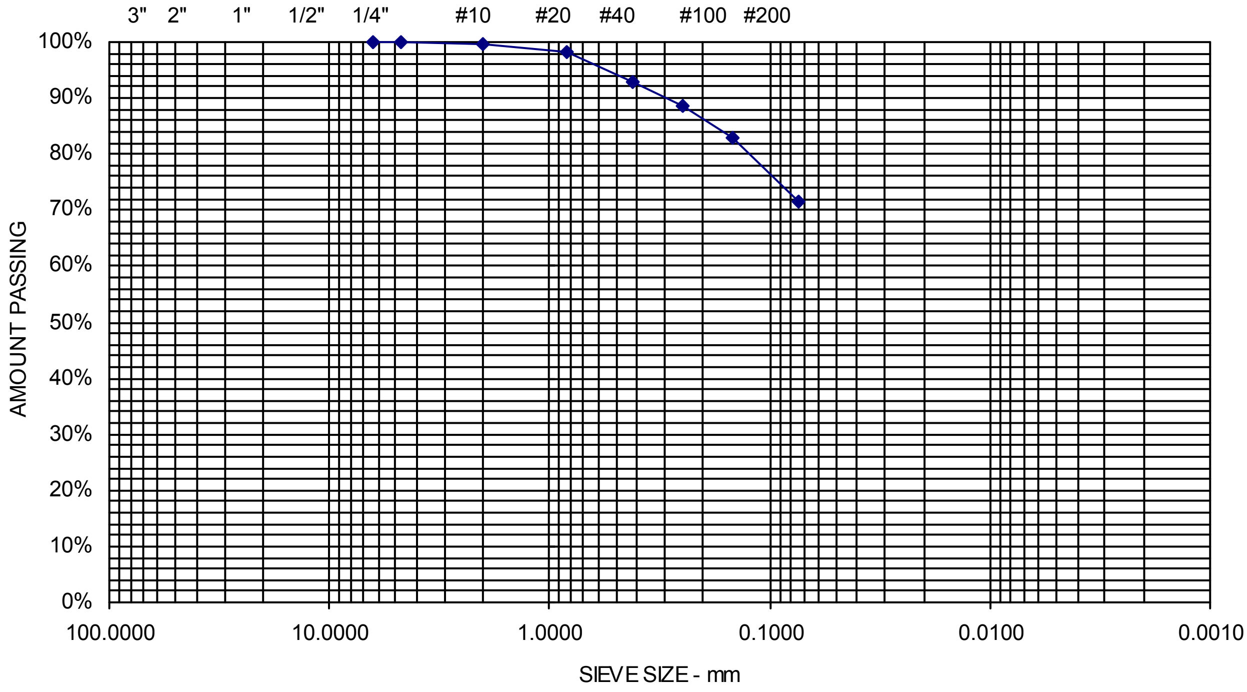
S.W.COLE
ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

Project Name	PORTSMOUTH NH - ARA PROJECT 53510 - LAB TESTING	Project Number	20-0893
		Lab ID	19872S
Client	ABSOLUTE RESOURCE ASSOCIATES	Date Received	7/1/2020
Exploration	**6/23 - 10:00**	Date Completed	7/13/2020
Material Source	**SED - 15**	Tested By	BRADLEY GERSCHWILER

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
6.3 mm	**1/4"**	**100**	
4.75 mm	**No. 4**	**100**	0.1% Gravel
2.00 mm	**No. 10**	**100**	
850 um	**No. 20**	**98**	
425 um	**No. 40**	**93**	28.4% Sand
250 um	**No. 60**	**88**	
150 um	**No. 100**	**83**	
75 um	**No. 200**	**71.5**	71.5% Fines



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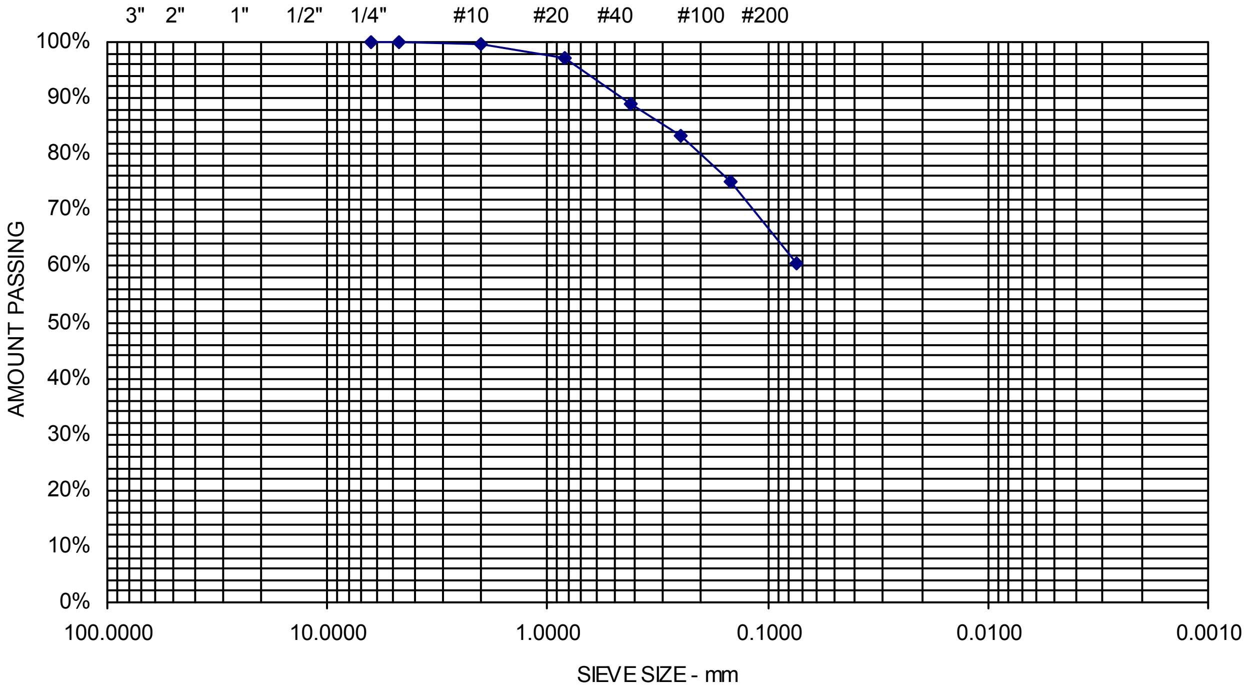
S.W.COLE ENGINEERING,INC.

Report of Gradation

ASTM C-117 & C-136

Project Name	PORTSMOUTH NH - ARA PROJECT 53510 - LAB TESTING	Project Number	20-0893
		Lab ID	19873S
Client	ABSOLUTE RESOURCE ASSOCIATES	Date Received	7/1/2020
Exploration	**6/23 - 13:00**	Date Completed	7/13/2020
Material Source	**SED - 16**	Tested By	BRADLEY GERSCHWILER

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
6.3 mm	**1/4"**	**100**	
4.75 mm	**No. 4**	**100**	0.1% Gravel
2.00 mm	**No. 10**	**100**	
850 um	**No. 20**	**97**	
425 um	**No. 40**	**89**	39.5% Sand
250 um	**No. 60**	**83**	
150 um	**No. 100**	**75**	
75 um	**No. 200**	**60.5**	60.5% Fines



Comments:

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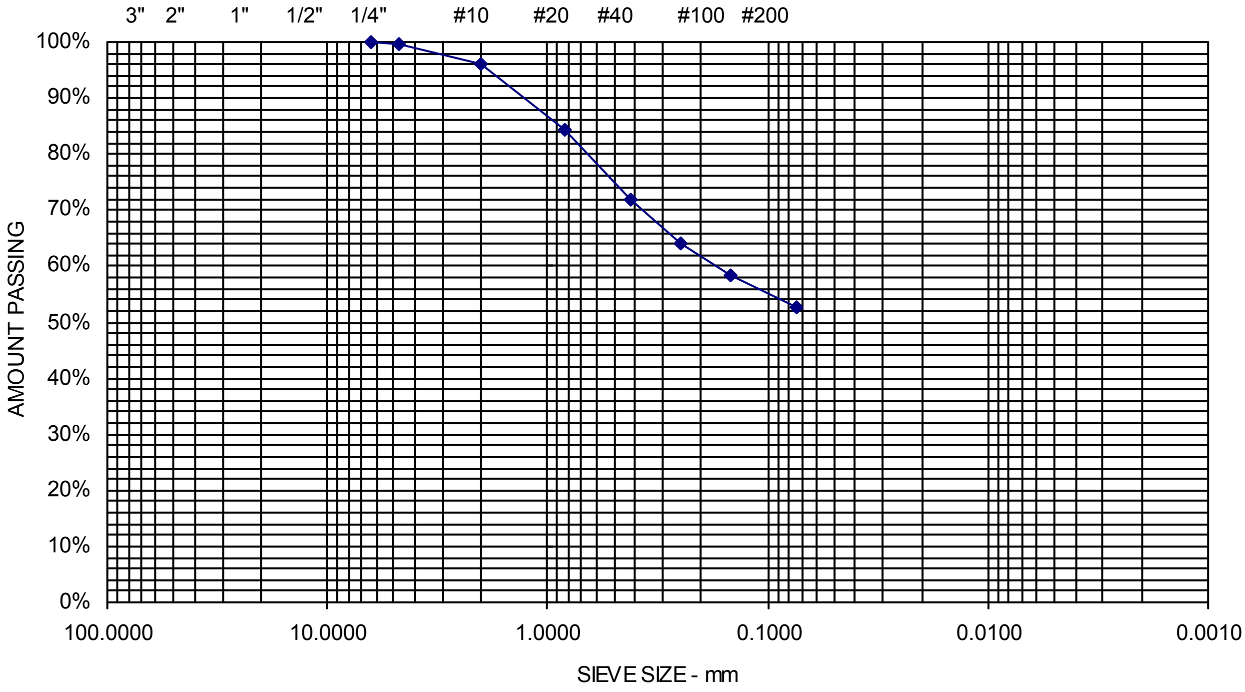
Report of Gradation

ASTM C-117 & C-136

Project Name	PORTSMOUTH NH - ARA PROJECT 53510 - LAB TESTING	Project Number	20-0893
		Lab ID	19874S
Client	ABSOLUTE RESOURCE ASSOCIATES	Date Received	7/1/2020
Exploration	**6/23 - 16:00**	Date Completed	7/13/2020
Material Source	**SED - 17**	Tested By	BRADLEY GERSCHWILER

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
6.3 mm	**1/4"**	**100**	
4.75 mm	**No. 4**	**100**	0.2% Gravel
2.00 mm	**No. 10**	**96**	
850 um	**No. 20**	**84**	
425 um	**No. 40**	**72**	46.9% Sand
250 um	**No. 60**	**64**	
150 um	**No. 100**	**58**	
75 um	**No. 200**	**52.8**	52.8% Fines



Comments:

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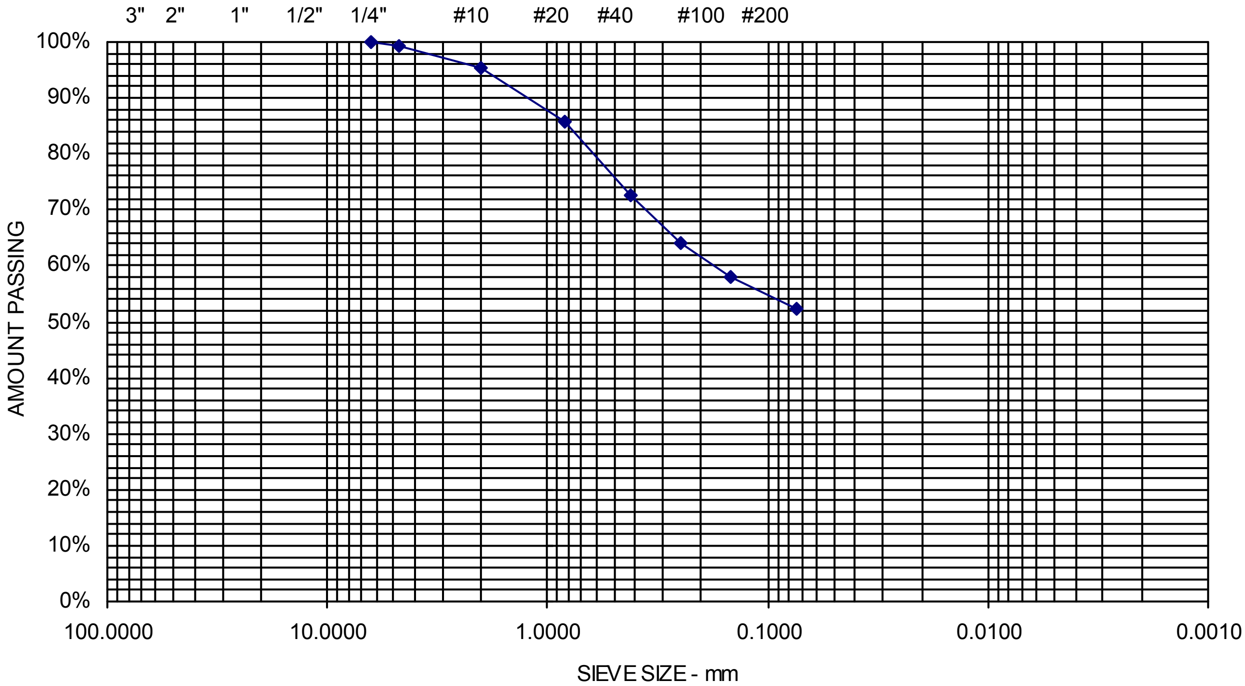
S.W.COLE
ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

Project Name	PORTSMOUTH NH - ARA PROJECT 53510 - LAB TESTING	Project Number	20-0893
		Lab ID	19875S
Client	ABSOLUTE RESOURCE ASSOCIATES	Date Received	7/1/2020
Exploration	**6/23 - 15:00**	Date Completed	7/13/2020
Material Source	**SED - 18**	Tested By	BRADLEY GERSCHWILER

STANDARD DESIGNATION (mm/μm)	SIEVE SIZE	AMOUNT PASSING (%)	
6.3 mm	**1/4"**	**100**	
4.75 mm	**No. 4**	**99**	0.7% Gravel
2.00 mm	**No. 10**	**95**	
850 um	**No. 20**	**86**	
425 um	**No. 40**	**73**	47% Sand
250 um	**No. 60**	**64**	
150 um	**No. 100**	**58**	
75 um	**No. 200**	**52.3**	52.3% Fines



Comments:

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SLH

Laboratory Report

Absolute Resource associates
124 Heritage Avenue Portsmouth NH 03801

Bill Arcieri	PO Number: None
Vanasse Hangen Brustlin, Inc.	Job ID: 53510
6 Bedford Farms Drive	Date Received: 6/23/20
Suite 607	
Bedford, NH 03110	

Project: Mill Pond 52633

Attached please find results for the analysis of the samples received on the date referenced above.

Subcontracted analyses are provided under separate cover.

Unless otherwise noted in the attached report, the analyses performed met the requirements of Absolute Resource Associates' Quality Assurance Plan. The Standard Operating Procedures are based upon USEPA SW-846, USEPA Methods for Chemical Analysis of Water and Wastewater, Standard Methods for the Examination of Water and Wastewater and other recognized methodologies. The results contained in this report pertain only to the samples as indicated on the chain of custody.

Absolute Resource Associates maintains certification with the agencies listed below. The reported results apply to the sample(s) in the condition as received at the time the laboratory took custody. This report shall not be reproduced except in full and with approval from the laboratory. The liability of ARA is limited to the cost of the requested analyses, unless otherwise agreed upon in writing.

We appreciate the opportunity to provide laboratory services. If you have any questions regarding the enclosed report, please contact the laboratory and we will be glad to assist you.

Sincerely,
Absolute Resource Associates

Aaron DeWees	Date of Approval: 7/10/2020
Chief Operating Officer	Total number of pages: 45

Absolute Resource Associates Certifications

New Hampshire	1732	Massachusetts	M-NH902
Maine	NH902		

Sample Association Table

Field ID	Matrix	Date-Time Sampled	Lab#	Analysis
SED-13	Solid	6/23/2020 12:00	53510-001	
				ABN Extractables in solids by 8270 SIM/Scan
				Arsenic in solids by 6020
				Barium in solids by 6020
				Cadmium in solids by 6020
				Chromium in solids by 6020
				Combo: RCRA 8 Metals
				Grain Size - Hydrometer (subcontract)
				Lead in solids by 6020
				Mercury in solids by 7471
				Nitrate-N in solids (NO3) by 300.0A
				Nitrite-N in solids (NO2) by 300.0A
				PCBs in solids by Soxhlet 8082
				Pesticides in solids by 8081
				Selenium in solids by 6020
				Shipping & Handling to Subcontract Lab
				Silver in solids by 6020
				Solid Digestion for ICP Analysis
				TOC in Solids by 9060A (subcontract)
				Total Kjeldahl Nitrogen in solids by ASTMD359002A
				Total Nitrogen (NO2 + NO3 + TKN)
				Total Phosphate in solids by 365.3
SED-16	Solid	6/23/2020 13:00	53510-002	
				ABN Extractables in solids by 8270 SIM/Scan
				Arsenic in solids by 6020
				Barium in solids by 6020
				Cadmium in solids by 6020
				Chromium in solids by 6020
				Combo: RCRA 8 Metals
				Field Specified Laboratory Duplicate
				Field Specified Matrix Spike
				Grain Size - Hydrometer (subcontract)
				Lead in solids by 6020
				Mercury in solids by 7471
				Nitrate-N in solids (NO3) by 300.0A
				Nitrite-N in solids (NO2) by 300.0A
				PCBs in solids by Soxhlet 8082
				Pesticides in solids by 8081
				Selenium in solids by 6020
				Silver in solids by 6020
				Solid Digestion for ICP Analysis
				TOC in Solids by 9060A (subcontract)
				Total Kjeldahl Nitrogen in solids by ASTMD359002A
				Total Nitrogen (NO2 + NO3 + TKN)
				Total Phosphate in solids by 365.3

Project ID: Mill Pond 52633

Sample Association Table

Field ID	Matrix	Date-Time Sampled	Lab#	Analysis
SED-DP	Solid	6/23/2020 12:50	53510-003	
				ABN Extractables in solids by 8270 SIM/Scan
				Arsenic in solids by 6020
				Barium in solids by 6020
				Cadmium in solids by 6020
				Chromium in solids by 6020
				Combo: RCRA 8 Metals
				Lead in solids by 6020
				Mercury in solids by 7471
				Nitrate-N in solids (NO3) by 300.0A
				Nitrite-N in solids (NO2) by 300.0A
				PCBs in solids by Soxhlet 8082
				Pesticides in solids by 8081
				Selenium in solids by 6020
				Silver in solids by 6020
				Solid Digestion for ICP Analysis
				TOC in Solids by 9060A (subcontract)
				Total Kjeldahl Nitrogen in solids by ASTMD359002A
				Total Nitrogen (NO2 + NO3 + TKN)
				Total Phosphate in solids by 365.3
SED-14	Solid	6/23/2020 11:00	53510-004	
				ABN Extractables in solids by 8270 SIM/Scan
				Arsenic in solids by 6020
				Barium in solids by 6020
				Cadmium in solids by 6020
				Chromium in solids by 6020
				Combo: RCRA 8 Metals
				Grain Size - Hydrometer (subcontract)
				Lead in solids by 6020
				Mercury in solids by 7471
				Nitrate-N in solids (NO3) by 300.0A
				Nitrite-N in solids (NO2) by 300.0A
				PCBs in solids by Soxhlet 8082
				Pesticides in solids by 8081
				Selenium in solids by 6020
				Silver in solids by 6020
				Solid Digestion for ICP Analysis
				TOC in Solids by 9060A (subcontract)
				Total Kjeldahl Nitrogen in solids by ASTMD359002A
				Total Nitrogen (NO2 + NO3 + TKN)
				Total Phosphate in solids by 365.3

Project ID: Mill Pond 52633

Sample Association Table

Field ID	Matrix	Date-Time Sampled	Lab#	Analysis
SED-15	Solid	6/23/2020 10:00	53510-005	
				ABN Extractables in solids by 8270 SIM/Scan
				Arsenic in solids by 6020
				Barium in solids by 6020
				Cadmium in solids by 6020
				Chromium in solids by 6020
				Combo: RCRA 8 Metals
				Grain Size - Hydrometer (subcontract)
				Lead in solids by 6020
				Mercury in solids by 7471
				Nitrate-N in solids (NO3) by 300.0A
				Nitrite-N in solids (NO2) by 300.0A
				PCBs in solids by Soxhlet 8082
				Pesticides in solids by 8081
				Selenium in solids by 6020
				Silver in solids by 6020
				Solid Digestion for ICP Analysis
				TOC in Solids by 9060A (subcontract)
				Total Kjeldahl Nitrogen in solids by ASTMD359002A
				Total Nitrogen (NO2 + NO3 + TKN)
				Total Phosphate in solids by 365.3
SED-17	Solid	6/23/2020 16:00	53510-006	
				ABN Extractables in solids by 8270 SIM/Scan
				Arsenic in solids by 6020
				Barium in solids by 6020
				Cadmium in solids by 6020
				Chromium in solids by 6020
				Combo: RCRA 8 Metals
				Grain Size - Hydrometer (subcontract)
				Lead in solids by 6020
				Mercury in solids by 7471
				Nitrate-N in solids (NO3) by 300.0A
				Nitrite-N in solids (NO2) by 300.0A
				PCBs in solids by Soxhlet 8082
				Pesticides in solids by 8081
				Selenium in solids by 6020
				Silver in solids by 6020
				Solid Digestion for ICP Analysis
				TOC in Solids by 9060A (subcontract)
				Total Kjeldahl Nitrogen in solids by ASTMD359002A
				Total Nitrogen (NO2 + NO3 + TKN)
				Total Phosphate in solids by 365.3

Sample Association Table

Field ID	Matrix	Date-Time Sampled	Lab#	Analysis
SED-18	Solid	6/23/2020 15:00	53510-007	
				ABN Extractables in solids by 8270 SIM/Scan
				Arsenic in solids by 6020
				Barium in solids by 6020
				Cadmium in solids by 6020
				Chromium in solids by 6020
				Combo: RCRA 8 Metals
				Grain Size - Hydrometer (subcontract)
				Lead in solids by 6020
				Mercury in solids by 7471
				Nitrate-N in solids (NO3) by 300.0A
				Nitrite-N in solids (NO2) by 300.0A
				PCBs in solids by Soxhlet 8082
				Pesticides in solids by 8081
				Selenium in solids by 6020
				Silver in solids by 6020
				Solid Digestion for ICP Analysis
				TOC in Solids by 9060A (subcontract)
				Total Kjeldahl Nitrogen in solids by ASTMD359002A
				Total Nitrogen (NO2 + NO3 + TKN)
				Total Phosphate in solids by 365.3
SED-FB	Water	6/23/2020 16:30	53510-008	
				Arsenic in water by 6020
				Barium in water by 6020
				Cadmium in water by 6020
				Chromium in water by 6020
				Combo: RCRA 8 Metals
				Lead in water by 6020
				Mercury in water by 7470
				PAHs in water by 8270SIM
				Selenium in water by 6020
				Silver in water by 6020
				Water Digestion for ICP Analysis

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-001
Sample ID: SED-13
Matrix: Solid Percent Dry: 33.3% Results expressed on a dry weight basis.
Sampled: 6/23/20 12:00

Parameter	Result	Reporting Limit	Units	Instr Dil'n Factor	Analyst	Prep Date	Batch	Analysis Date	Analysis Time	Reference
naphthalene (SIM)	< 0.014	0.014	ug/g	1	CL	6/25/20	12899	6/29/20	18:45	SW3546/8270E
2-methylnaphthalene (SIM)	< 0.014	0.014	ug/g	1	CL	6/25/20	12899	6/29/20	18:45	SW3546/8270E
acenaphthylene (SIM)	< 0.014	0.014	ug/g	1	CL	6/25/20	12899	6/29/20	18:45	SW3546/8270E
acenaphthene (SIM)	< 0.014	0.014	ug/g	1	CL	6/25/20	12899	6/29/20	18:45	SW3546/8270E
dibenzofuran (SIM)	< 0.014	0.014	ug/g	1	CL	6/25/20	12899	6/29/20	18:45	SW3546/8270E
fluorene (SIM)	< 0.014	0.014	ug/g	1	CL	6/25/20	12899	6/29/20	18:45	SW3546/8270E
phenanthrene (SIM)	**0.022**	0.014	ug/g	1	CL	6/25/20	12899	6/29/20	18:45	SW3546/8270E
anthracene (SIM)	< 0.014	0.014	ug/g	1	CL	6/25/20	12899	6/29/20	18:45	SW3546/8270E
fluoranthene (SIM)	**0.040**	0.014	ug/g	1	CL	6/25/20	12899	6/29/20	18:45	SW3546/8270E
pyrene (SIM)	**0.040**	0.014	ug/g	1	CL	6/25/20	12899	6/29/20	18:45	SW3546/8270E
benzo(a)anthracene (SIM)	< 0.014	0.014	ug/g	1	CL	6/25/20	12899	6/29/20	18:45	SW3546/8270E
chrysene (SIM)	**0.015**	0.014	ug/g	1	CL	6/25/20	12899	6/29/20	18:45	SW3546/8270E
benzo(b)fluoranthene (SIM)	**0.015**	0.014	ug/g	1	CL	6/25/20	12899	6/29/20	18:45	SW3546/8270E
benzo(k)fluoranthene (SIM)	< 0.014	0.014	ug/g	1	CL	6/25/20	12899	6/29/20	18:45	SW3546/8270E
benzo(a)pyrene (SIM)	**0.027**	0.014	ug/g	1	CL	6/25/20	12899	6/29/20	18:45	SW3546/8270E
indeno(1,2,3-cd)pyrene (SIM)	**0.014**	0.014	ug/g	1	CL	6/25/20	12899	6/29/20	18:45	SW3546/8270E
dibenzo(a,h)anthracene (SIM)	< 0.014	0.014	ug/g	1	CL	6/25/20	12899	6/29/20	18:45	SW3546/8270E
benzo(g,h,i)perylene (SIM)	< 0.014	0.014	ug/g	1	CL	6/25/20	12899	6/29/20	18:45	SW3546/8270E
Surrogate Recovery		**Limits**								
nitrobenzene-D5 SUR	**70**	35-114	%	1	CL	6/25/20	12899	6/29/20	18:45	SW3546/8270E
2-fluorobiphenyl SUR	**77**	43-116	%	1	CL	6/25/20	12899	6/29/20	18:45	SW3546/8270E
p-terphenyl-D14 SUR	**81**	33-141	%	1	CL	6/25/20	12899	6/29/20	18:45	SW3546/8270E

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-002
Sample ID: SED-16
Matrix: Solid Percent Dry: 35.6% Results expressed on a dry weight basis.
Sampled: 6/23/20 13:00

Parameter	Result	Reporting Limit	Units	Instr Dil'n Factor	Analyst	Prep Date	Batch	Analysis Date	Time	Reference
naphthalene (SIM)	**0.055**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:15	SW3546/8270E
2-methylnaphthalene (SIM)	**0.035**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:15	SW3546/8270E
acenaphthylene (SIM)	**0.15**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:15	SW3546/8270E
acenaphthene (SIM)	**0.017**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:15	SW3546/8270E
dibenzofuran (SIM)	**0.017**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:15	SW3546/8270E
fluorene (SIM)	**0.048**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:15	SW3546/8270E
phenanthrene (SIM)	**0.60**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:15	SW3546/8270E
anthracene (SIM)	**0.14**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:15	SW3546/8270E
fluoranthene (SIM)	**1.00**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:15	SW3546/8270E
pyrene (SIM)	**0.94**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:15	SW3546/8270E
benzo(a)anthracene (SIM)	**0.34**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:15	SW3546/8270E
chrysene (SIM)	**0.50**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:15	SW3546/8270E
benzo(b)fluoranthene (SIM)	**0.44**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:15	SW3546/8270E
benzo(k)fluoranthene (SIM)	**0.44**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:15	SW3546/8270E
benzo(a)pyrene (SIM)	**0.47**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:15	SW3546/8270E
indeno(1,2,3-cd)pyrene (SIM)	**0.34**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:15	SW3546/8270E
dibenzo(a,h)anthracene (SIM)	**0.11**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:15	SW3546/8270E
benzo(g,h,i)perylene (SIM)	**0.38**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:15	SW3546/8270E
Surrogate Recovery		**Limits**								
nitrobenzene-D5 SUR	**65**	35-114	%	1	CL	6/25/20	12899	6/29/20	19:15	SW3546/8270E
2-fluorobiphenyl SUR	**74**	43-116	%	1	CL	6/25/20	12899	6/29/20	19:15	SW3546/8270E
p-terphenyl-D14 SUR	**68**	33-141	%	1	CL	6/25/20	12899	6/29/20	19:15	SW3546/8270E

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-003
Sample ID: SED-DP
Matrix: Solid Percent Dry: 33.8% Results expressed on a dry weight basis.
Sampled: 6/23/20 12:50

Parameter	Result	Reporting Limit	Units	Instr Dil'n Factor	Analyst	Prep Date	Batch	Analysis		Reference
								Date	Time	
naphthalene (SIM)	**0.039**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:45	SW3546/8270E
2-methylnaphthalene (SIM)	**0.025**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:45	SW3546/8270E
acenaphthylene (SIM)	**0.14**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:45	SW3546/8270E
acenaphthene (SIM)	**0.015**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:45	SW3546/8270E
dibenzofuran (SIM)	< 0.013	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:45	SW3546/8270E
fluorene (SIM)	**0.034**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:45	SW3546/8270E
phenanthrene (SIM)	**0.57**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:45	SW3546/8270E
anthracene (SIM)	**0.13**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:45	SW3546/8270E
fluoranthene (SIM)	**0.97**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:45	SW3546/8270E
pyrene (SIM)	**0.94**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:45	SW3546/8270E
benzo(a)anthracene (SIM)	**0.37**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:45	SW3546/8270E
chrysene (SIM)	**0.52**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:45	SW3546/8270E
benzo(b)fluoranthene (SIM)	**0.47**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:45	SW3546/8270E
benzo(k)fluoranthene (SIM)	**0.46**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:45	SW3546/8270E
benzo(a)pyrene (SIM)	**0.52**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:45	SW3546/8270E
indeno(1,2,3-cd)pyrene (SIM)	**0.37**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:45	SW3546/8270E
dibenzo(a,h)anthracene (SIM)	**0.13**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:45	SW3546/8270E
benzo(g,h,i)perylene (SIM)	**0.41**	0.013	ug/g	1	CL	6/25/20	12899	6/29/20	19:45	SW3546/8270E
Surrogate Recovery		**Limits**								
nitrobenzene-D5 SUR	**69**	35-114	%	1	CL	6/25/20	12899	6/29/20	19:45	SW3546/8270E
2-fluorobiphenyl SUR	**79**	43-116	%	1	CL	6/25/20	12899	6/29/20	19:45	SW3546/8270E
p-terphenyl-D14 SUR	**78**	33-141	%	1	CL	6/25/20	12899	6/29/20	19:45	SW3546/8270E

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-004
Sample ID: SED-14
Matrix: Solid Percent Dry: 37.4% Results expressed on a dry weight basis.
Sampled: 6/23/20 11:00

Parameter	Result	Reporting Limit	Units	Instr Dil'n Factor	Analyst	Prep Date	Batch	Analysis Date	Analysis Time	Reference
naphthalene (SIM)	< 0.012	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:15	SW3546/8270E
2-methylnaphthalene (SIM)	< 0.012	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:15	SW3546/8270E
acenaphthylene (SIM)	**0.016**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:15	SW3546/8270E
acenaphthene (SIM)	< 0.012	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:15	SW3546/8270E
dibenzofuran (SIM)	< 0.012	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:15	SW3546/8270E
fluorene (SIM)	< 0.012	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:15	SW3546/8270E
phenanthrene (SIM)	**0.031**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:15	SW3546/8270E
anthracene (SIM)	< 0.012	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:15	SW3546/8270E
fluoranthene (SIM)	**0.076**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:15	SW3546/8270E
pyrene (SIM)	**0.079**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:15	SW3546/8270E
benzo(a)anthracene (SIM)	**0.039**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:15	SW3546/8270E
chrysene (SIM)	**0.042**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:15	SW3546/8270E
benzo(b)fluoranthene (SIM)	**0.046**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:15	SW3546/8270E
benzo(k)fluoranthene (SIM)	**0.048**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:15	SW3546/8270E
benzo(a)pyrene (SIM)	**0.058**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:15	SW3546/8270E
indeno(1,2,3-cd)pyrene (SIM)	**0.041**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:15	SW3546/8270E
dibenzo(a,h)anthracene (SIM)	< 0.012	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:15	SW3546/8270E
benzo(g,h,i)perylene (SIM)	**0.040**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:15	SW3546/8270E
Surrogate Recovery		**Limits**								
nitrobenzene-D5 SUR	**64**	35-114	%	1	CL	6/25/20	12899	6/29/20	20:15	SW3546/8270E
2-fluorobiphenyl SUR	**74**	43-116	%	1	CL	6/25/20	12899	6/29/20	20:15	SW3546/8270E
p-terphenyl-D14 SUR	**75**	33-141	%	1	CL	6/25/20	12899	6/29/20	20:15	SW3546/8270E

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-005
Sample ID: SED-15
Matrix: Solid Percent Dry: 45.1% Results expressed on a dry weight basis.
Sampled: 6/23/20 10:00

Parameter	Result	Reporting Limit	Units	Instr Dil'n Factor	Analyst	Prep Date	Batch	Analysis Date	Analysis Time	Reference
naphthalene (SIM)	**0.050**	0.010	ug/g	1	CL	6/25/20	12899	6/29/20	21:16	SW3546/8270E
2-methylnaphthalene (SIM)	**0.034**	0.010	ug/g	1	CL	6/25/20	12899	6/29/20	21:16	SW3546/8270E
acenaphthylene (SIM)	**0.17**	0.010	ug/g	1	CL	6/25/20	12899	6/29/20	21:16	SW3546/8270E
acenaphthene (SIM)	**0.023**	0.010	ug/g	1	CL	6/25/20	12899	6/29/20	21:16	SW3546/8270E
dibenzofuran (SIM)	**0.021**	0.010	ug/g	1	CL	6/25/20	12899	6/29/20	21:16	SW3546/8270E
fluorene (SIM)	**0.055**	0.010	ug/g	1	CL	6/25/20	12899	6/29/20	21:16	SW3546/8270E
phenanthrene (SIM)	**0.72**	0.010	ug/g	1	CL	6/25/20	12899	6/29/20	21:16	SW3546/8270E
anthracene (SIM)	**0.15**	0.010	ug/g	1	CL	6/25/20	12899	6/29/20	21:16	SW3546/8270E
fluoranthene (SIM)	**1.1**	0.010	ug/g	1	CL	6/25/20	12899	6/29/20	21:16	SW3546/8270E
pyrene (SIM)	**1.1**	0.010	ug/g	1	CL	6/25/20	12899	6/29/20	21:16	SW3546/8270E
benzo(a)anthracene (SIM)	**0.40**	0.010	ug/g	1	CL	6/25/20	12899	6/29/20	21:16	SW3546/8270E
chrysene (SIM)	**0.55**	0.010	ug/g	1	CL	6/25/20	12899	6/29/20	21:16	SW3546/8270E
benzo(b)fluoranthene (SIM)	**0.49**	0.010	ug/g	1	CL	6/25/20	12899	6/29/20	21:16	SW3546/8270E
benzo(k)fluoranthene (SIM)	**0.48**	0.010	ug/g	1	CL	6/25/20	12899	6/29/20	21:16	SW3546/8270E
benzo(a)pyrene (SIM)	**0.54**	0.010	ug/g	1	CL	6/25/20	12899	6/29/20	21:16	SW3546/8270E
indeno(1,2,3-cd)pyrene (SIM)	**0.38**	0.010	ug/g	1	CL	6/25/20	12899	6/29/20	21:16	SW3546/8270E
dibenzo(a,h)anthracene (SIM)	**0.12**	0.010	ug/g	1	CL	6/25/20	12899	6/29/20	21:16	SW3546/8270E
benzo(g,h,i)perylene (SIM)	**0.42**	0.010	ug/g	1	CL	6/25/20	12899	6/29/20	21:16	SW3546/8270E
Surrogate Recovery		**Limits**								
nitrobenzene-D5 SUR	**66**	35-114	%	1	CL	6/25/20	12899	6/29/20	21:16	SW3546/8270E
2-fluorobiphenyl SUR	**77**	43-116	%	1	CL	6/25/20	12899	6/29/20	21:16	SW3546/8270E
p-terphenyl-D14 SUR	**81**	33-141	%	1	CL	6/25/20	12899	6/29/20	21:16	SW3546/8270E

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-006
Sample ID: SED-17
Matrix: Solid Percent Dry: 39% Results expressed on a dry weight basis.
Sampled: 6/23/20 16:00

Parameter	Result	Reporting Limit	Units	Instr Dil'n Factor	Analyst	Prep Date	Batch	Analysis Date	Analysis Time	Reference
naphthalene (SIM)	< 0.012	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:45	SW3546/8270E
2-methylnaphthalene (SIM)	< 0.012	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:45	SW3546/8270E
acenaphthylene (SIM)	**0.025**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:45	SW3546/8270E
acenaphthene (SIM)	< 0.012	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:45	SW3546/8270E
dibenzofuran (SIM)	< 0.012	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:45	SW3546/8270E
fluorene (SIM)	< 0.012	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:45	SW3546/8270E
phenanthrene (SIM)	**0.10**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:45	SW3546/8270E
anthracene (SIM)	**0.028**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:45	SW3546/8270E
fluoranthene (SIM)	**0.26**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:45	SW3546/8270E
pyrene (SIM)	**0.27**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:45	SW3546/8270E
benzo(a)anthracene (SIM)	**0.11**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:45	SW3546/8270E
chrysene (SIM)	**0.14**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:45	SW3546/8270E
benzo(b)fluoranthene (SIM)	**0.16**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:45	SW3546/8270E
benzo(k)fluoranthene (SIM)	**0.13**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:45	SW3546/8270E
benzo(a)pyrene (SIM)	**0.17**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:45	SW3546/8270E
indeno(1,2,3-cd)pyrene (SIM)	**0.12**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:45	SW3546/8270E
dibenzo(a,h)anthracene (SIM)	**0.039**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:45	SW3546/8270E
benzo(g,h,i)perylene (SIM)	**0.13**	0.012	ug/g	1	CL	6/25/20	12899	6/29/20	20:45	SW3546/8270E
Surrogate Recovery		**Limits**								
nitrobenzene-D5 SUR	**62**	35-114	%	1	CL	6/25/20	12899	6/29/20	20:45	SW3546/8270E
2-fluorobiphenyl SUR	**71**	43-116	%	1	CL	6/25/20	12899	6/29/20	20:45	SW3546/8270E
p-terphenyl-D14 SUR	**70**	33-141	%	1	CL	6/25/20	12899	6/29/20	20:45	SW3546/8270E

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-007
Sample ID: SED-18
Matrix: Solid Percent Dry: 43% Results expressed on a dry weight basis.
Sampled: 6/23/20 15:00

Parameter	Result	Reporting Limit	Units	Instr Dil'n Factor	Analyst	Prep Date	Batch	Analysis Date	Analysis Time	Reference
naphthalene (SIM)	**0.012**	0.011	ug/g	1	CL	6/25/20	12899	6/29/20	18:15	SW3546/8270E
2-methylnaphthalene (SIM)	< 0.011	0.011	ug/g	1	CL	6/25/20	12899	6/29/20	18:15	SW3546/8270E
acenaphthylene (SIM)	**0.067**	0.011	ug/g	1	CL	6/25/20	12899	6/29/20	18:15	SW3546/8270E
acenaphthene (SIM)	< 0.011	0.011	ug/g	1	CL	6/25/20	12899	6/29/20	18:15	SW3546/8270E
dibenzofuran (SIM)	< 0.011	0.011	ug/g	1	CL	6/25/20	12899	6/29/20	18:15	SW3546/8270E
fluorene (SIM)	< 0.011	0.011	ug/g	1	CL	6/25/20	12899	6/29/20	18:15	SW3546/8270E
phenanthrene (SIM)	**0.30**	0.011	ug/g	1	CL	6/25/20	12899	6/29/20	18:15	SW3546/8270E
anthracene (SIM)	**0.084**	0.011	ug/g	1	CL	6/25/20	12899	6/29/20	18:15	SW3546/8270E
fluoranthene (SIM)	**1.1**	0.011	ug/g	1	CL	6/25/20	12899	6/29/20	18:15	SW3546/8270E
pyrene (SIM)	**0.95**	0.011	ug/g	1	CL	6/25/20	12899	6/29/20	18:15	SW3546/8270E
benzo(a)anthracene (SIM)	**0.54**	0.011	ug/g	1	CL	6/25/20	12899	6/29/20	18:15	SW3546/8270E
chrysene (SIM)	**0.56**	0.011	ug/g	1	CL	6/25/20	12899	6/29/20	18:15	SW3546/8270E
benzo(b)fluoranthene (SIM)	**0.46**	0.011	ug/g	1	CL	6/25/20	12899	6/29/20	18:15	SW3546/8270E
benzo(k)fluoranthene (SIM)	**0.42**	0.011	ug/g	1	CL	6/25/20	12899	6/29/20	18:15	SW3546/8270E
benzo(a)pyrene (SIM)	**0.51**	0.011	ug/g	1	CL	6/25/20	12899	6/29/20	18:15	SW3546/8270E
indeno(1,2,3-cd)pyrene (SIM)	**0.30**	0.011	ug/g	1	CL	6/25/20	12899	6/29/20	18:15	SW3546/8270E
dibenzo(a,h)anthracene (SIM)	**0.11**	0.011	ug/g	1	CL	6/25/20	12899	6/29/20	18:15	SW3546/8270E
benzo(g,h,i)perylene (SIM)	**0.27**	0.011	ug/g	1	CL	6/25/20	12899	6/29/20	18:15	SW3546/8270E
Surrogate Recovery		**Limits**								
nitrobenzene-D5 SUR	**63**	35-114	%	1	CL	6/25/20	12899	6/29/20	18:15	SW3546/8270E
2-fluorobiphenyl SUR	**71**	43-116	%	1	CL	6/25/20	12899	6/29/20	18:15	SW3546/8270E
p-terphenyl-D14 SUR	**73**	33-141	%	1	CL	6/25/20	12899	6/29/20	18:15	SW3546/8270E

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-008
Sample ID: SED-FB
Matrix: Water
Sampled: 6/23/20 16:30

Parameter	Result	Reporting Limit	Units	Instr Dil'n Factor	Analyst	Prep Date	Batch	Analysis Date	Analysis Time	Reference
naphthalene	< 0.1	0.1	ug/L	1	CL	6/24/20	12895	6/29/20	12:12	SW3510C8270E
2-methylnaphthalene	< 0.1	0.1	ug/L	1	CL	6/24/20	12895	6/29/20	12:12	SW3510C8270E
acenaphthylene	< 0.1	0.1	ug/L	1	CL	6/24/20	12895	6/29/20	12:12	SW3510C8270E
acenaphthene	< 0.1	0.1	ug/L	1	CL	6/24/20	12895	6/29/20	12:12	SW3510C8270E
dibenzofuran	< 0.1	0.1	ug/L	1	CL	6/24/20	12895	6/29/20	12:12	SW3510C8270E
fluorene	< 0.1	0.1	ug/L	1	CL	6/24/20	12895	6/29/20	12:12	SW3510C8270E
phenanthrene	< 0.1	0.1	ug/L	1	CL	6/24/20	12895	6/29/20	12:12	SW3510C8270E
anthracene	< 0.1	0.1	ug/L	1	CL	6/24/20	12895	6/29/20	12:12	SW3510C8270E
fluoranthene	< 0.1	0.1	ug/L	1	CL	6/24/20	12895	6/29/20	12:12	SW3510C8270E
pyrene	< 0.1	0.1	ug/L	1	CL	6/24/20	12895	6/29/20	12:12	SW3510C8270E
benzo(a)anthracene	< 0.1	0.1	ug/L	1	CL	6/24/20	12895	6/29/20	12:12	SW3510C8270E
chrysene	< 0.1	0.1	ug/L	1	CL	6/24/20	12895	6/29/20	12:12	SW3510C8270E
benzo(b)fluoranthene	< 0.1	0.1	ug/L	1	CL	6/24/20	12895	6/29/20	12:12	SW3510C8270E
benzo(k)fluoranthene	< 0.1	0.1	ug/L	1	CL	6/24/20	12895	6/29/20	12:12	SW3510C8270E
benzo(a)pyrene	< 0.1	0.1	ug/L	1	CL	6/24/20	12895	6/29/20	12:12	SW3510C8270E
indeno(1,2,3-cd)pyrene	< 0.1	0.1	ug/L	1	CL	6/24/20	12895	6/29/20	12:12	SW3510C8270E
dibenzo(a,h)anthracene	< 0.1	0.1	ug/L	1	CL	6/24/20	12895	6/29/20	12:12	SW3510C8270E
benzo(g,h,i)perylene	< 0.1	0.1	ug/L	1	CL	6/24/20	12895	6/29/20	12:12	SW3510C8270E
Surrogate Recovery		**Limits**								
2-fluorobiphenyl SUR	**70**	43-116	%	1	CL	6/24/20	12895	6/29/20	12:12	SW3510C8270E
o-terphenyl SUR	**79**	33-141	%	1	CL	6/24/20	12895	6/29/20	12:12	SW3510C8270E

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-001
Sample ID: SED-13
Matrix: Solid Percent Dry: 33.3% Results expressed on a dry weight basis.
Sampled: 6/23/20 12:00

Parameter	Result	Reporting Limit	Units	Instr Dil'n Factor	Analyst	Prep Date	Batch	Analysis Date	Analysis Time	Reference
Arsenic	< 7.5	7.5	ug/g	5	EEB	6/25/20	12903	6/26/20	1:25	SW3051A6020A
Barium	**110**	15	ug/g	5	EEB	6/25/20	12903	6/26/20	1:25	SW3051A6020A
Cadmium	< 1.5	1.5	ug/g	5	EEB	6/25/20	12903	6/26/20	1:25	SW3051A6020A
Chromium	**39**	15	ug/g	5	EEB	6/25/20	12903	6/26/20	1:25	SW3051A6020A
Lead	**17**	7.5	ug/g	5	EEB	6/25/20	12903	6/26/20	1:25	SW3051A6020A
Mercury	< 0.083	0.083	ug/g	1	EEB	7/8/20	12925	7/9/20	10:37	SW7471B
Selenium	< 15	15	ug/g	5	EEB	6/25/20	12903	6/26/20	1:25	SW3051A6020A
Silver	< 0.30	0.30	ug/g	5	EEB	6/25/20	12903	6/26/20	1:25	SW3051A6020A

Sample#: 53510-002
Sample ID: SED-16
Matrix: Solid Percent Dry: 35.6% Results expressed on a dry weight basis.
Sampled: 6/23/20 13:00

Parameter	Result	Reporting Limit	Units	Instr Dil'n Factor	Analyst	Prep Date	Batch	Analysis Date	Analysis Time	Reference
Arsenic	**13**M	6.3	ug/g	5	EEB	6/25/20	12903	6/26/20	1:33	SW3051A6020A
M = The recovery for the matrix spike was 73%. The acceptance criteria is 75-125%.										
Barium	**120**	13	ug/g	5	EEB	6/25/20	12903	6/26/20	1:33	SW3051A6020A
Cadmium	< 1.3	1.3	ug/g	5	EEB	6/25/20	12903	6/26/20	1:33	SW3051A6020A
Chromium	**32**	13	ug/g	5	EEB	6/25/20	12903	6/26/20	1:33	SW3051A6020A
Lead	**59**	6.3	ug/g	5	EEB	6/25/20	12903	6/26/20	1:33	SW3051A6020A
Mercury	**1.1**	0.075	ug/g	1	EEB	7/8/20	12925	7/9/20	10:39	SW7471B
Selenium	< 13M	13	ug/g	5	EEB	6/25/20	12903	6/26/20	1:33	SW3051A6020A
M = The recovery for the matrix spike was 67%. The acceptance criteria is 75-125%.										
Silver	**0.89**	0.25	ug/g	5	EEB	6/25/20	12903	6/26/20	1:33	SW3051A6020A

Sample#: 53510-003
Sample ID: SED-DP
Matrix: Solid Percent Dry: 33.8% Results expressed on a dry weight basis.
Sampled: 6/23/20 12:50

Parameter	Result	Reporting Limit	Units	Instr Dil'n Factor	Analyst	Prep Date	Batch	Analysis Date	Analysis Time	Reference
Arsenic	**15**	7.1	ug/g	5	EEB	6/25/20	12903	6/29/20	21:09	SW3051A6020A
Barium	**130**	14	ug/g	5	EEB	6/25/20	12903	6/26/20	1:58	SW3051A6020A
Cadmium	**2.1**	1.4	ug/g	5	EEB	6/25/20	12903	6/26/20	1:58	SW3051A6020A
Chromium	**37**	14	ug/g	5	EEB	6/25/20	12903	6/29/20	21:09	SW3051A6020A
Lead	**68**	7.1	ug/g	5	EEB	6/25/20	12903	6/26/20	1:58	SW3051A6020A
Mercury	**1.2**	0.11	ug/g	1	EEB	7/8/20	12925	7/9/20	10:45	SW7471B
Selenium	< 14	14	ug/g	5	EEB	6/25/20	12903	6/29/20	21:09	SW3051A6020A
Silver	**1.6**	0.28	ug/g	5	EEB	6/25/20	12903	6/26/20	1:58	SW3051A6020A

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-004
Sample ID: SED-14
Matrix: Solid Percent Dry: 37.4% Results expressed on a dry weight basis.
Sampled: 6/23/20 11:00

Parameter	Result	Reporting Limit	Units	Instr Dil'n Factor	Analyst	Prep Date	Batch	Analysis Date	Time	Reference
Arsenic	**8.9**	6.2	ug/g	5	EEB	6/25/20	12903	6/26/20	2:31	SW3051A6020A
Barium	**110**	12	ug/g	5	EEB	6/25/20	12903	6/26/20	2:31	SW3051A6020A
Cadmium	< 1.2	1.2	ug/g	5	EEB	6/25/20	12903	6/26/20	2:31	SW3051A6020A
Chromium	**30**	12	ug/g	5	EEB	6/25/20	12903	6/26/20	2:31	SW3051A6020A
Lead	**18**	6.2	ug/g	5	EEB	6/25/20	12903	6/26/20	2:31	SW3051A6020A
Mercury	< 0.085	0.085	ug/g	1	EEB	7/8/20	12925	7/9/20	10:46	SW7471B
Selenium	< 12	12	ug/g	5	EEB	6/25/20	12903	6/26/20	2:31	SW3051A6020A
Silver	< 0.25	0.25	ug/g	5	EEB	6/25/20	12903	6/26/20	2:31	SW3051A6020A

Sample#: 53510-005
Sample ID: SED-15
Matrix: Solid Percent Dry: 45.1% Results expressed on a dry weight basis.
Sampled: 6/23/20 10:00

Parameter	Result	Reporting Limit	Units	Instr Dil'n Factor	Analyst	Prep Date	Batch	Analysis Date	Time	Reference
Arsenic	**13**	5.4	ug/g	5	EEB	6/25/20	12903	6/26/20	2:40	SW3051A6020A
Barium	**120**	11	ug/g	5	EEB	6/25/20	12903	6/26/20	2:40	SW3051A6020A
Cadmium	< 1.1	1.1	ug/g	5	EEB	6/25/20	12903	6/26/20	2:40	SW3051A6020A
Chromium	**33**	11	ug/g	5	EEB	6/25/20	12903	6/26/20	2:40	SW3051A6020A
Lead	**71**	5.4	ug/g	5	EEB	6/25/20	12903	6/26/20	2:40	SW3051A6020A
Mercury	**1.4**	0.077	ug/g	1	EEB	7/8/20	12925	7/9/20	10:48	SW7471B
Selenium	< 11	11	ug/g	5	EEB	6/25/20	12903	6/26/20	2:40	SW3051A6020A
Silver	**1.3**	0.22	ug/g	5	EEB	6/25/20	12903	6/26/20	2:40	SW3051A6020A

Sample#: 53510-006
Sample ID: SED-17
Matrix: Solid Percent Dry: 39% Results expressed on a dry weight basis.
Sampled: 6/23/20 16:00

Parameter	Result	Reporting Limit	Units	Instr Dil'n Factor	Analyst	Prep Date	Batch	Analysis Date	Time	Reference
Arsenic	**12**	6.4	ug/g	5	EEB	6/25/20	12903	6/26/20	2:48	SW3051A6020A
Barium	**47**	13	ug/g	5	EEB	6/25/20	12903	6/26/20	2:48	SW3051A6020A
Cadmium	< 1.3	1.3	ug/g	5	EEB	6/25/20	12903	6/26/20	2:48	SW3051A6020A
Chromium	**73**	13	ug/g	5	EEB	6/25/20	12903	6/26/20	2:48	SW3051A6020A
Lead	**43**	6.4	ug/g	5	EEB	6/25/20	12903	6/26/20	2:48	SW3051A6020A
Mercury	**0.33**	0.089	ug/g	1	EEB	7/8/20	12925	7/9/20	10:50	SW7471B
Selenium	< 13	13	ug/g	5	EEB	6/25/20	12903	6/26/20	2:48	SW3051A6020A
Silver	**0.46**	0.26	ug/g	5	EEB	6/25/20	12903	6/26/20	2:48	SW3051A6020A

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-007
Sample ID: SED-18
Matrix: Solid Percent Dry: 43% Results expressed on a dry weight basis.
Sampled: 6/23/20 15:00

Parameter	Result	Reporting Limit	Units	Instr Dil'n Factor	Analyst	Prep Date	Batch	Analysis Date	Analysis Time	Reference
Arsenic	**10**	5.3	ug/g	5	EEB	6/25/20	12903	6/26/20	2:56	SW3051A6020A
Barium	**48**	11	ug/g	5	EEB	6/25/20	12903	6/26/20	2:56	SW3051A6020A
Cadmium	< 1.1	1.1	ug/g	5	EEB	6/25/20	12903	6/26/20	2:56	SW3051A6020A
Chromium	**76**	11	ug/g	5	EEB	6/25/20	12903	6/26/20	2:56	SW3051A6020A
Lead	**44**	5.3	ug/g	5	EEB	6/25/20	12903	6/26/20	2:56	SW3051A6020A
Mercury	**0.47**	0.064	ug/g	1	EEB	7/8/20	12925	7/9/20	10:52	SW7471B
Selenium	< 11	11	ug/g	5	EEB	6/25/20	12903	6/26/20	2:56	SW3051A6020A
Silver	**0.52**	0.21	ug/g	5	EEB	6/25/20	12903	6/26/20	2:56	SW3051A6020A

Sample#: 53510-008
Sample ID: SED-FB
Matrix: Water
Sampled: 6/23/20 16:30

Parameter	Result	Reporting Limit	Units	Instr Dil'n Factor	Analyst	Prep Date	Batch	Analysis Date	Analysis Time	Reference
Arsenic	< 0.0050	0.0050	mg/L	1	EEB	6/25/20	12902	6/26/20	0:51	SW3005A6020A
Barium	< 0.010	0.010	mg/L	1	EEB	6/25/20	12902	6/26/20	0:51	SW3005A6020A
Cadmium	< 0.0010	0.0010	mg/L	1	EEB	6/25/20	12902	6/26/20	0:51	SW3005A6020A
Chromium	< 0.010	0.010	mg/L	1	EEB	6/25/20	12902	6/26/20	0:51	SW3005A6020A
Lead	< 0.0050	0.0050	mg/L	1	EEB	6/25/20	12902	6/26/20	0:51	SW3005A6020A
Mercury	< 0.00020	0.00020	mg/L	1	EEB	7/1/20	12911	7/1/20	14:27	SW7470A
Selenium	< 0.010	0.010	mg/L	1	EEB	6/25/20	12902	6/26/20	0:51	SW3005A6020A
Silver	< 0.0050	0.0050	mg/L	1	EEB	6/25/20	12902	6/26/20	0:51	SW3005A6020A

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-001
Sample ID: SED-13
Matrix: Solid Percent Dry: 33.3% Results expressed on a dry weight basis.
Sampled: 6/23/20 12:00

		Reporting		Instr Dil'n		Prep		Analysis		
Parameter	Result	Limit	Units	Factor	Analyst	Date	Batch	Date	Time	Reference
Nitrate-N	< 3.0	3.0	ug/g	1	DBV		2002766	6/26/20	17:17	E300.0A
Nitrite-N	< 3.0	3.0	ug/g	1	DBV		2002766	6/26/20	17:17	E300.0A
Nitrogen, total	**5000**	270	ug/g	1			2002858			CALC
Total Kjeldahl Nitrogen (TKN)	**5000**	270	ug/g	1	WAS		2002784	7/2/20	4:30	ASTMD359002A
Total Phosphorus as P	**1500**	140	ug/g	10	SFM		2002795	7/1/20	10:50	E365.3

Sample#: 53510-002
Sample ID: SED-16
Matrix: Solid Percent Dry: 35.6% Results expressed on a dry weight basis.
Sampled: 6/23/20 13:00

		Reporting		Instr Dil'n		Prep		Analysis		
Parameter	Result	Limit	Units	Factor	Analyst	Date	Batch	Date	Time	Reference
Nitrate-N	< 2.8	2.8	ug/g	1	DBV		2002766	6/26/20	17:33	E300.0A
Nitrite-N	< 2.8	2.8	ug/g	1	DBV		2002766	6/26/20	17:33	E300.0A
Nitrogen, total	**3400**	280	ug/g	1			2002858			CALC
Total Kjeldahl Nitrogen (TKN)	**3400**D	280	ug/g	1	WAS		2002784	7/2/20	4:30	ASTMD359002A

D = The RPD between the MS/D was outside acceptance criteria.

Total Phosphorus as P	**1100**	130	ug/g	10	SFM		2002795	7/1/20	10:50	E365.3

Sample#: 53510-003
Sample ID: SED-DP
Matrix: Solid Percent Dry: 33.8% Results expressed on a dry weight basis.
Sampled: 6/23/20 12:50

		Reporting		Instr Dil'n		Prep		Analysis		
Parameter	Result	Limit	Units	Factor	Analyst	Date	Batch	Date	Time	Reference
Nitrate-N	< 3.0	3.0	ug/g	1	DBV		2002766	6/26/20	17:50	E300.0A
Nitrite-N	< 3.0	3.0	ug/g	1	DBV		2002766	6/26/20	17:50	E300.0A
Nitrogen, total	**3200**	270	ug/g	1			2002858			CALC
Total Kjeldahl Nitrogen (TKN)	**3200**	270	ug/g	1	WAS		2002784	7/2/20	4:30	ASTMD359002A
Total Phosphorus as P	**1000**	120	ug/g	10	SFM		2002795	7/1/20	10:50	E365.3

Sample#: 53510-004
Sample ID: SED-14
Matrix: Solid Percent Dry: 37.4% Results expressed on a dry weight basis.
Sampled: 6/23/20 11:00

		Reporting		Instr Dil'n		Prep		Analysis		
Parameter	Result	Limit	Units	Factor	Analyst	Date	Batch	Date	Time	Reference
Nitrate-N	< 2.7	2.7	ug/g	1	DBV		2002766	6/26/20	18:06	E300.0A
Nitrite-N	< 2.7	2.7	ug/g	1	DBV		2002766	6/26/20	18:06	E300.0A
Nitrogen, total	**4200**	220	ug/g	1			2002858			CALC
Total Kjeldahl Nitrogen (TKN)	**4200**	220	ug/g	1	WAS		2002784	7/2/20	4:30	ASTMD359002A
Total Phosphorus as P	**540**	110	ug/g	10	SFM		2002795	7/1/20	10:50	E365.3

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-005
Sample ID: SED-15
Matrix: Solid Percent Dry: 45.1% Results expressed on a dry weight basis.
Sampled: 6/23/20 10:00

Parameter	Result	Reporting Limit	Units	Instr Dil'n Factor	Analyst	Prep Date	Batch	Analysis Date	Analysis Time	Reference
Nitrate-N	< 2.2	2.2	ug/g	1	DBV		2002766	6/26/20	18:23	E300.0A
Nitrite-N	< 2.2	2.2	ug/g	1	DBV		2002766	6/26/20	18:23	E300.0A
Nitrogen, total	**1600**	220	ug/g	1			2002858			CALC
Total Kjeldahl Nitrogen (TKN)	**1600**	220	ug/g	1	WAS		2002784	7/2/20	4:30	ASTMD359002A
Total Phosphorus as P	**910**	110	ug/g	10	SFM		2002795	7/1/20	10:50	E365.3

Sample#: 53510-006
Sample ID: SED-17
Matrix: Solid Percent Dry: 39% Results expressed on a dry weight basis.
Sampled: 6/23/20 16:00

Parameter	Result	Reporting Limit	Units	Instr Dil'n Factor	Analyst	Prep Date	Batch	Analysis Date	Analysis Time	Reference
Nitrate-N	< 2.7	2.7	ug/g	1	DBV		2002766	6/26/20	18:39	E300.0A
Nitrite-N	< 2.7	2.7	ug/g	1	DBV		2002766	6/26/20	18:39	E300.0A
Nitrogen, total	**2500**	210	ug/g	1			2002858			CALC
Total Kjeldahl Nitrogen (TKN)	**2500**	210	ug/g	1	WAS		2002784	7/2/20	4:30	ASTMD359002A
Total Phosphorus as P	**780**	110	ug/g	10	SFM		2002795	7/1/20	10:50	E365.3

Sample#: 53510-007
Sample ID: SED-18
Matrix: Solid Percent Dry: 43% Results expressed on a dry weight basis.
Sampled: 6/23/20 15:00

Parameter	Result	Reporting Limit	Units	Instr Dil'n Factor	Analyst	Prep Date	Batch	Analysis Date	Analysis Time	Reference
Nitrate-N	< 2.3	2.3	ug/g	1	DBV		2002766	6/26/20	20:49	E300.0A
Nitrite-N	< 2.3	2.3	ug/g	1	DBV		2002766	6/26/20	20:49	E300.0A
Nitrogen, total	**2400**	190	ug/g	1			2002858			CALC
Total Kjeldahl Nitrogen (TKN)	**2400**	190	ug/g	1	WAS		2002784	7/2/20	4:30	ASTMD359002A
Total Phosphorus as P	**790**	120	ug/g	10	SFM		2002795	7/1/20	10:50	E365.3

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-001
Sample ID: SED-13
Matrix: Solid Percent Dry: 33.3% Results expressed on a dry weight basis.
Sampled: 6/23/20 12:00

		Reporting			Instr Dil'n		Prep			Analysis		
Parameter	Result	Limit	DL	Units	Factor	Analyst	Date	Time	Batch	Date	Time	Reference
alpha-BHC	U	0.11	0.0085	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B
beta-BHC	U	0.11	0.011	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B
delta-BHC	U	0.11	0.011	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B
gamma-BHC (Lindane)	U	0.11	0.011	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B
Heptachlor	U	0.11	0.011	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B
Aldrin	U	0.11	0.014	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B
Heptachlor Epoxide	U	0.11	0.020	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B
Endosulfan I	U	0.11	0.014	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B
Dieldrin	U	0.11	0.014	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B
4,4'-DDE	U	0.11	0.020	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B
Endrin	U	0.11	0.020	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B
Endosulfan II	U	0.11	0.017	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B
4,4'-DDD	U	0.11	0.017	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B
Endosulfan Sulfate	U	0.11	0.0085	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B
4,4'-DDT	U	0.11	0.017	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B
Methoxychlor	U	0.11	0.031	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B
Endrin Ketone	U	0.11	0.020	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B
Endrin Aldehyde	U	0.11	0.043	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B
alpha-Chlordane	U	0.11	0.014	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B
gamma-Chlordane	U	0.11	0.014	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B
Toxaphene	U	0.57	0.11	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B
Surrogate Recovery		Limits										
tetrachloro-m-xylene SUR	44	30-150		%	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B
decachlorobiphenyl SUR	53	30-150		%	1	ACA	6/23/20	23:00	12890	6/25/20	13:06	SW3546/8081B

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-002
Sample ID: SED-16
Matrix: Solid Percent Dry: 35.6% Results expressed on a dry weight basis.
Sampled: 6/23/20 13:00

		Reporting			Instr Dil'n		Prep			Analysis		
Parameter	Result	Limit	DL	Units	Factor	Analyst	Date	Time	Batch	Date	Time	Reference
alpha-BHC	U M	0.11	0.0083	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B
beta-BHC	U M	0.11	0.011	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B
delta-BHC	U M	0.11	0.011	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B
gamma-BHC (Lindane)	U M	0.11	0.011	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B
Heptachlor	U M	0.11	0.011	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B
Aldrin	U M	0.11	0.014	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B
Heptachlor Epoxide	U M	0.11	0.019	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B
Endosulfan I	U M	0.11	0.014	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B
Dieldrin	U M	0.11	0.014	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B
4,4'-DDE	U M	0.11	0.019	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B
Endrin	U M	0.11	0.019	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B
Endosulfan II	U M	0.11	0.017	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B
4,4'-DDD	U M	0.11	0.017	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B
Endosulfan Sulfate	U M	0.11	0.0083	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B
4,4'-DDT	U M	0.11	0.017	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B
Methoxychlor	U M	0.11	0.031	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B
Endrin Ketone	U M	0.11	0.019	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B
Endrin Aldehyde	U M	0.11	0.042	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B
alpha-Chlordane	U M	0.11	0.014	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B
gamma-Chlordane	U M	0.11	0.014	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B
Toxaphene	U	0.55	0.11	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B
Surrogate Recovery		Limits										
tetrachloro-m-xylene SUR	53	30-150		%	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B
decachlorobiphenyl SUR	54	30-150		%	1	ACA	6/23/20	23:00	12890	6/25/20	14:10	SW3546/8081B

M = The percent recovery and/or RPD for the MS/D was outside acceptance criteria. See case narrative.

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-003
Sample ID: SED-DP
Matrix: Solid Percent Dry: 33.8% Results expressed on a dry weight basis.
Sampled: 6/23/20 12:50

		Reporting			Instr Dil'n		Prep			Analysis		
Parameter	Result	Limit	DL	Units	Factor	Analyst	Date	Time	Batch	Date	Time	Reference
alpha-BHC	U	0.11	0.0080	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B
beta-BHC	U	0.11	0.011	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B
delta-BHC	U	0.11	0.011	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B
gamma-BHC (Lindane)	U	0.11	0.011	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B
Heptachlor	U	0.11	0.011	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B
Aldrin	U	0.11	0.013	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B
Heptachlor Epoxide	U	0.11	0.019	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B
Endosulfan I	U	0.11	0.013	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B
Dieldrin	U	0.11	0.013	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B
4,4'-DDE	U	0.11	0.019	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B
Endrin	U	0.11	0.019	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B
Endosulfan II	U	0.11	0.016	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B
4,4'-DDD	0.02 J	0.11	0.016	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B
Endosulfan Sulfate	U	0.11	0.0080	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B
4,4'-DDT	U	0.11	0.016	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B
Methoxychlor	U	0.11	0.029	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B
Endrin Ketone	U	0.11	0.019	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B
Endrin Aldehyde	U	0.11	0.040	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B
alpha-Chlordane	U	0.11	0.013	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B
gamma-Chlordane	U	0.11	0.013	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B
Toxaphene	U	0.54	0.11	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B
Surrogate Recovery		Limits										
tetrachloro-m-xylene SUR	48	30-150		%	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B
decachlorobiphenyl SUR	53	30-150		%	1	ACA	6/23/20	23:00	12890	6/25/20	14:48	SW3546/8081B

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-004
Sample ID: SED-14
Matrix: Solid Percent Dry: 37.4% Results expressed on a dry weight basis.
Sampled: 6/23/20 11:00

Parameter	Result	Reporting Limit	DL	Units	Instr Dil'n Factor	Analyst	Prep Date	Prep Time	Batch	Analysis Date	Analysis Time	Reference
alpha-BHC	U	0.098	0.0074	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B
beta-BHC	U	0.098	0.0098	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B
delta-BHC	U	0.098	0.0098	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B
gamma-BHC (Lindane)	U	0.098	0.0098	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B
Heptachlor	U	0.098	0.0098	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B
Aldrin	U	0.098	0.012	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B
Heptachlor Epoxide	U	0.098	0.017	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B
Endosulfan I	U	0.098	0.012	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B
Dieldrin	U	0.098	0.012	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B
4,4'-DDE	U	0.098	0.017	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B
Endrin	U	0.098	0.017	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B
Endosulfan II	U	0.098	0.015	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B
4,4'-DDD	U	0.098	0.015	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B
Endosulfan Sulfate	U	0.098	0.0074	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B
4,4'-DDT	U	0.098	0.015	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B
Methoxychlor	U	0.098	0.027	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B
Endrin Ketone	U	0.098	0.017	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B
Endrin Aldehyde	U	0.098	0.037	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B
alpha-Chlordane	U	0.098	0.012	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B
gamma-Chlordane	U	0.098	0.012	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B
Toxaphene	U	0.49	0.098	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B
Surrogate Recovery		Limits										
tetrachloro-m-xylene SUR	41	30-150		%	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B
decachlorobiphenyl SUR	49	30-150		%	1	ACA	6/23/20	23:00	12890	6/25/20	13:19	SW3546/8081B

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-005
Sample ID: SED-15
Matrix: Solid Percent Dry: 45.1% Results expressed on a dry weight basis.
Sampled: 6/23/20 10:00

		Reporting			Instr Dil'n		Prep			Analysis		
Parameter	Result	Limit	DL	Units	Factor	Analyst	Date	Time	Batch	Date	Time	Reference
alpha-BHC	U	0.082	0.0062	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B
beta-BHC	U	0.082	0.0082	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B
delta-BHC	U	0.082	0.0082	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B
gamma-BHC (Lindane)	U	0.082	0.0082	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B
Heptachlor	U	0.082	0.0082	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B
Aldrin	U	0.082	0.010	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B
Heptachlor Epoxide	U	0.082	0.014	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B
Endosulfan I	U	0.082	0.010	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B
Dieldrin	U	0.082	0.010	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B
4,4'-DDE	U	0.082	0.014	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B
Endrin	U	0.082	0.014	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B
Endosulfan II	U	0.082	0.012	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B
4,4'-DDD	U	0.082	0.012	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B
Endosulfan Sulfate	U	0.082	0.0062	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B
4,4'-DDT	U	0.082	0.012	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B
Methoxychlor	U	0.082	0.023	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B
Endrin Ketone	U	0.082	0.014	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B
Endrin Aldehyde	U	0.082	0.031	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B
alpha-Chlordane	U	0.082	0.010	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B
gamma-Chlordane	U	0.082	0.010	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B
Toxaphene	U	0.41	0.082	ug/g	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B
Surrogate Recovery		Limits										
tetrachloro-m-xylene SUR	40	30-150		%	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B
decachlorobiphenyl SUR	44	30-150		%	1	ACA	6/23/20	23:00	12890	6/25/20	13:31	SW3546/8081B

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-006
Sample ID: SED-17
Matrix: Solid Percent Dry: 39% Results expressed on a dry weight basis.
Sampled: 6/23/20 16:00

Parameter	Result	Reporting Limit	DL	Units	Instr Dil'n Factor	Analyst	Prep Date	Prep Time	Batch	Analysis Date	Analysis Time	Reference
alpha-BHC	U	0.092	0.0069	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B
beta-BHC	U	0.092	0.0092	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B
delta-BHC	U	0.092	0.0092	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B
gamma-BHC (Lindane)	U	0.092	0.0092	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B
Heptachlor	U	0.092	0.0092	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B
Aldrin	U	0.092	0.012	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B
Heptachlor Epoxide	U	0.092	0.016	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B
Endosulfan I	U	0.092	0.012	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B
Dieldrin	U	0.092	0.012	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B
4,4'-DDE	U	0.092	0.016	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B
Endrin	U	0.092	0.016	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B
Endosulfan II	U	0.092	0.014	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B
4,4'-DDD	U	0.092	0.014	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B
Endosulfan Sulfate	U	0.092	0.0069	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B
4,4'-DDT	U	0.092	0.014	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B
Methoxychlor	U	0.092	0.025	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B
Endrin Ketone	U	0.092	0.016	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B
Endrin Aldehyde	U	0.092	0.035	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B
alpha-Chlordane	U	0.092	0.012	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B
gamma-Chlordane	U	0.092	0.012	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B
Toxaphene	U	0.46	0.092	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B
Surrogate Recovery		Limits										
tetrachloro-m-xylene SUR	38	30-150		%	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B
decachlorobiphenyl SUR	42	30-150		%	1	ACA	6/23/20	23:00	12890	6/26/20	15:15	SW3546/8081B

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-007
Sample ID: SED-18
Matrix: Solid Percent Dry: 43% Results expressed on a dry weight basis.
Sampled: 6/23/20 15:00

Parameter	Result	Reporting Limit	DL	Units	Instr Dil'n Factor	Analyst	Prep Date	Prep Time	Batch	Analysis Date	Analysis Time	Reference
alpha-BHC	U	0.093	0.0070	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B
beta-BHC	U	0.093	0.0093	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B
delta-BHC	U	0.093	0.0093	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B
gamma-BHC (Lindane)	U	0.093	0.0093	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B
Heptachlor	U	0.093	0.0093	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B
Aldrin	U	0.093	0.012	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B
Heptachlor Epoxide	U	0.093	0.016	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B
Endosulfan I	U	0.093	0.012	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B
Dieldrin	U	0.093	0.012	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B
4,4'-DDE	U	0.093	0.016	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B
Endrin	U	0.093	0.016	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B
Endosulfan II	U	0.093	0.014	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B
4,4'-DDD	U	0.093	0.014	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B
Endosulfan Sulfate	U	0.093	0.0070	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B
4,4'-DDT	U	0.093	0.014	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B
Methoxychlor	U	0.093	0.025	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B
Endrin Ketone	U	0.093	0.016	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B
Endrin Aldehyde	U	0.093	0.035	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B
alpha-Chlordane	U	0.093	0.012	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B
gamma-Chlordane	U	0.093	0.012	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B
Toxaphene	U	0.46	0.093	ug/g	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B
Surrogate Recovery		Limits										
tetrachloro-m-xylene SUR	47	30-150		%	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B
decachlorobiphenyl SUR	47	30-150		%	1	ACA	6/23/20	23:00	12890	6/26/20	15:28	SW3546/8081B

Absolute Resource associates

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-001
Sample ID: SED-13
Matrix: Solid Percent Dry: 33.3% Results expressed on a dry weight basis.
Sampled: 6/23/20 12:00

Parameter	Result	Reporting Limit	DL	Units	Instr Dil'n Factor	Analyst	Prep Date	Prep Time	Batch	Analysis Date	Analysis Time	Reference
PCB-1016	U	0.099	0.030	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	14:49	SW3540C8082A
PCB-1221	U	0.099	0.030	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	14:49	SW3540C8082A
PCB-1232	U	0.099	0.030	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	14:49	SW3540C8082A
PCB-1242	U	0.099	0.030	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	14:49	SW3540C8082A
PCB-1248	U	0.099	0.030	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	14:49	SW3540C8082A
PCB-1254	U	0.099	0.030	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	14:49	SW3540C8082A
PCB-1260	U	0.099	0.030	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	14:49	SW3540C8082A
Surrogate Recovery		Limits										
tetrachloro-m-xylene SUR	52	30-150		%	1	DBV	6/25/20	15:15	12900	7/1/20	14:49	SW3540C8082A
decachlorobiphenyl SUR	55	30-150		%	1	DBV	6/25/20	15:15	12900	7/1/20	14:49	SW3540C8082A

Sample#: 53510-002
Sample ID: SED-16
Matrix: Solid Percent Dry: 35.6% Results expressed on a dry weight basis.
Sampled: 6/23/20 13:00

Parameter	Result	Reporting Limit	DL	Units	Instr Dil'n Factor	Analyst	Prep Date	Prep Time	Batch	Analysis Date	Analysis Time	Reference
PCB-1016	U	0.076	0.023	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	15:04	SW3540C8082A
PCB-1221	U	0.076	0.023	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	15:04	SW3540C8082A
PCB-1232	U	0.076	0.023	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	15:04	SW3540C8082A
PCB-1242	U	0.076	0.023	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	15:04	SW3540C8082A
PCB-1248	U	0.076	0.023	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	15:04	SW3540C8082A
PCB-1254	U	0.076	0.023	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	15:04	SW3540C8082A
PCB-1260	U	0.076	0.023	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	15:04	SW3540C8082A
Surrogate Recovery		Limits										
tetrachloro-m-xylene SUR	66	30-150		%	1	DBV	6/25/20	15:15	12900	7/1/20	15:04	SW3540C8082A
decachlorobiphenyl SUR	69	30-150		%	1	DBV	6/25/20	15:15	12900	7/1/20	15:04	SW3540C8082A

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-003
Sample ID: SED-DP
Matrix: Solid Percent Dry: 33.8% Results expressed on a dry weight basis.
Sampled: 6/23/20 12:50

Parameter	Result	Reporting Limit	DL	Units	Instr Dil'n Factor	Analyst	Prep Date	Prep Time	Batch	Analysis Date	Analysis Time	Reference
PCB-1016	U	0.088	0.026	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	16:36	SW3540C8082A
PCB-1221	U	0.088	0.026	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	16:36	SW3540C8082A
PCB-1232	U	0.088	0.026	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	16:36	SW3540C8082A
PCB-1242	U	0.088	0.026	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	16:36	SW3540C8082A
PCB-1248	U	0.088	0.026	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	16:36	SW3540C8082A
PCB-1254	U	0.088	0.026	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	16:36	SW3540C8082A
PCB-1260	U	0.088	0.026	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	16:36	SW3540C8082A
Surrogate Recovery		Limits										
tetrachloro-m-xylene SUR	65	30-150		%	1	DBV	6/25/20	15:15	12900	7/1/20	16:36	SW3540C8082A
decachlorobiphenyl SUR	74	30-150		%	1	DBV	6/25/20	15:15	12900	7/1/20	16:36	SW3540C8082A

Sample#: 53510-004
Sample ID: SED-14
Matrix: Solid Percent Dry: 37.4% Results expressed on a dry weight basis.
Sampled: 6/23/20 11:00

Parameter	Result	Reporting Limit	DL	Units	Instr Dil'n Factor	Analyst	Prep Date	Prep Time	Batch	Analysis Date	Analysis Time	Reference
PCB-1016	U	0.071	0.021	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	16:51	SW3540C8082A
PCB-1221	U	0.071	0.021	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	16:51	SW3540C8082A
PCB-1232	U	0.071	0.021	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	16:51	SW3540C8082A
PCB-1242	U	0.071	0.021	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	16:51	SW3540C8082A
PCB-1248	U	0.071	0.021	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	16:51	SW3540C8082A
PCB-1254	U	0.071	0.021	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	16:51	SW3540C8082A
PCB-1260	U	0.071	0.021	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	16:51	SW3540C8082A
Surrogate Recovery		Limits										
tetrachloro-m-xylene SUR	62	30-150		%	1	DBV	6/25/20	15:15	12900	7/1/20	16:51	SW3540C8082A
decachlorobiphenyl SUR	73	30-150		%	1	DBV	6/25/20	15:15	12900	7/1/20	16:51	SW3540C8082A

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-005
Sample ID: SED-15
Matrix: Solid Percent Dry: 45.1% Results expressed on a dry weight basis.
Sampled: 6/23/20 10:00

Parameter	Result	Reporting Limit	DL	Units	Instr Dil'n Factor	Analyst	Prep Date	Prep Time	Batch	Analysis Date	Analysis Time	Reference
PCB-1016	U	0.057	0.017	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	17:06	SW3540C8082A
PCB-1221	U	0.057	0.017	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	17:06	SW3540C8082A
PCB-1232	U	0.057	0.017	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	17:06	SW3540C8082A
PCB-1242	U	0.057	0.017	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	17:06	SW3540C8082A
PCB-1248	U	0.057	0.017	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	17:06	SW3540C8082A
PCB-1254	U	0.057	0.017	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	17:06	SW3540C8082A
PCB-1260	U	0.057	0.017	ug/g	1	DBV	6/25/20	15:15	12900	7/1/20	17:06	SW3540C8082A
Surrogate Recovery		Limits										
tetrachloro-m-xylene SUR	69	30-150		%	1	DBV	6/25/20	15:15	12900	7/1/20	17:06	SW3540C8082A
decachlorobiphenyl SUR	66	30-150		%	1	DBV	6/25/20	15:15	12900	7/1/20	17:06	SW3540C8082A

Sample#: 53510-006
Sample ID: SED-17
Matrix: Solid Percent Dry: 39% Results expressed on a dry weight basis.
Sampled: 6/23/20 16:00

Parameter	Result	Reporting Limit	DL	Units	Instr Dil'n Factor	Analyst	Prep Date	Prep Time	Batch	Analysis Date	Analysis Time	Reference
PCB-1016	U	0.065	0.020	ug/g	1	DBV	6/25/20	15:15	12900	7/7/20	12:44	SW3540C8082A
PCB-1221	U	0.065	0.020	ug/g	1	DBV	6/25/20	15:15	12900	7/7/20	12:44	SW3540C8082A
PCB-1232	U	0.065	0.020	ug/g	1	DBV	6/25/20	15:15	12900	7/7/20	12:44	SW3540C8082A
PCB-1242	U	0.065	0.020	ug/g	1	DBV	6/25/20	15:15	12900	7/7/20	12:44	SW3540C8082A
PCB-1248	U	0.065	0.020	ug/g	1	DBV	6/25/20	15:15	12900	7/7/20	12:44	SW3540C8082A
PCB-1254	U	0.065	0.020	ug/g	1	DBV	6/25/20	15:15	12900	7/7/20	12:44	SW3540C8082A
PCB-1260	U	0.065	0.020	ug/g	1	DBV	6/25/20	15:15	12900	7/7/20	12:44	SW3540C8082A
Surrogate Recovery		Limits										
tetrachloro-m-xylene SUR	55	30-150		%	1	DBV	6/25/20	15:15	12900	7/7/20	12:44	SW3540C8082A
decachlorobiphenyl SUR	76	30-150		%	1	DBV	6/25/20	15:15	12900	7/7/20	12:44	SW3540C8082A

Project ID: Mill Pond 52633
Job ID: 53510

Sample#: 53510-007
Sample ID: SED-18
Matrix: Solid Percent Dry: 43% Results expressed on a dry weight basis.
Sampled: 6/23/20 15:00

Parameter	Result	Reporting Limit	DL	Units	Instr Dil'n Factor	Analyst	Prep Date	Prep Time	Batch	Analysis Date	Analysis Time	Reference
PCB-1016	U	0.060	0.018	ug/g	1	DBV	6/25/20	15:15	12900	7/6/20	16:46	SW3540C8082A
PCB-1221	U	0.060	0.018	ug/g	1	DBV	6/25/20	15:15	12900	7/6/20	16:46	SW3540C8082A
PCB-1232	U	0.060	0.018	ug/g	1	DBV	6/25/20	15:15	12900	7/6/20	16:46	SW3540C8082A
PCB-1242	U	0.060	0.018	ug/g	1	DBV	6/25/20	15:15	12900	7/6/20	16:46	SW3540C8082A
PCB-1248	U	0.060	0.018	ug/g	1	DBV	6/25/20	15:15	12900	7/6/20	16:46	SW3540C8082A
PCB-1254	U	0.060	0.018	ug/g	1	DBV	6/25/20	15:15	12900	7/6/20	16:46	SW3540C8082A
PCB-1260	U	0.060	0.018	ug/g	1	DBV	6/25/20	15:15	12900	7/6/20	16:46	SW3540C8082A
Surrogate Recovery		Limits										
tetrachloro-m-xylene SUR	65	30-150		%	1	DBV	6/25/20	15:15	12900	7/6/20	16:46	SW3540C8082A
decachlorobiphenyl SUR	74	30-150		%	1	DBV	6/25/20	15:15	12900	7/6/20	16:46	SW3540C8082A

Quality Control Report

Absolute Resource
associates

124 Heritage Avenue Unit 16
Portsmouth, NH 03801
www.absoluteresourceassociates.com

Case Narrative
Lab # 53510

Sample Receiving and Chain of Custody Discrepancies

Samples were received in acceptable condition, on the day of sampling at 10 degrees C, on ice, and in accordance with sample handling, preservation and integrity guidelines.
The reported results are calculated on a "dry weight" basis.

Calibration

No exceptions noted.

Method Blank

No exceptions noted.

Surrogate Recoveries

No exceptions noted.

Laboratory Control Sample Results

No exceptions noted.

Matrix Spike/Matrix Spike Duplicate/Duplicate Results

Metals: The percent recovery for arsenic and selenium in the matrix spike (53510-002) was outside the acceptance criteria of 75-125%. All other batch QC was within acceptance. Results have been qualified accordingly.
Pesticides: The matrix spike duplicate for 53510-002 did not meet the acceptance criteria for Heptachlor, 4,4'-DDT, and Methoxychlor. The relative percent difference between the matrix spike and matrix spike duplicate for sample 53510-002 was outside the acceptance criteria for all compounds. The LCS/D met the method acceptance criteria. Matrix interference suspected. Results have been qualified accordingly.
TKN: The relative percent difference between the matrix spike and matrix spike duplicate for sample 53510-002 was outside the acceptance criteria. Matrix interference suspected. Results have been qualified accordingly.

Other

Reporting Limits: Dilutions performed during the analysis are noted on the result pages.

No other exceptions noted.

Data Qualifiers

U = This compound was analyzed for, but not detected above the associated method detection limit.
J = The analytical result was below the instrument calibration range, but above the method detection limit. The reported concentration is an estimate.

GLOSSARY

%R	Percent Recovery
BLK	Blank (Method Blank, Preparation Blank)
CCB	Continuing Calibration Blank
CCV	Continuing Calibration Verification
CRM	Certified Reference Material (associated with solid Metals samples)
CRMD	Certified Reference Material Duplicate (associated with solid Metals samples)
Dil'n	Dilution
DL	Detection Limit
DUP	Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Limit of Detection
LOQ	Limit of Quantitation
MB	Methanol Blank (associated with solid VOC samples)
MLCS	Methanol Laboratory Control Sample (associated with solid VOC samples)
MLCSD	Methanol Laboratory Control Sample Duplicate (associated with solid VOC samples)
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PB	Preparation Blank
QC	Quality Control
RL	Reporting Limit
RPD	Relative Percent Difference
SUR	Surrogate

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Portsmouth, NH 03801
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- QC Report -

Method	QC ID	Parameter	Associated Sample	Result	Units	Amt Added	%R	Limits	RPD	RPD Limit
SW3510C8270E	BLK12895	naphthalene		< 0.10	ug/L					
		2-methylnaphthalene		< 0.10	ug/L					
		acenaphthylene		< 0.10	ug/L					
		acenaphthene		< 0.10	ug/L					
		dibenzofuran		< 0.10	ug/L					
		fluorene		< 0.10	ug/L					
		phenanthrene		< 0.10	ug/L					
		anthracene		< 0.10	ug/L					
		fluoranthene		< 0.10	ug/L					
		pyrene		< 0.10	ug/L					
		benzo(a)anthracene		< 0.10	ug/L					
		chrysene		< 0.10	ug/L					
		benzo(b)fluoranthene		< 0.10	ug/L					
		benzo(k)fluoranthene		< 0.10	ug/L					
		benzo(a)pyrene		< 0.10	ug/L					
		indeno(1,2,3-cd)pyrene		< 0.10	ug/L					
		dibenzo(a,h)anthracene		< 0.10	ug/L					
		benzo(g,h,i)perylene		< 0.10	ug/L					
		2-fluorobiphenyl SUR		67	%			43 116		
SW3510C8270E	LCS12895	naphthalene		22	ug/L	40	55	40 140		
		2-methylnaphthalene		25	ug/L	40	62	40 140		
		acenaphthylene		27	ug/L	40	68	40 140		
		acenaphthene		27	ug/L	40	67	40 140		
		dibenzofuran		27	ug/L	40	69	40 140		
		fluorene		33	ug/L	40	82	40 140		
		phenanthrene		30	ug/L	40	74	40 140		
		anthracene		28	ug/L	40	71	40 140		
		fluoranthene		30	ug/L	40	76	40 140		
		pyrene		34	ug/L	40	85	40 140		
		benzo(a)anthracene		35	ug/L	40	86	40 140		
		chrysene		34	ug/L	40	85	40 140		
		benzo(b)fluoranthene		36	ug/L	40	89	40 140		
		benzo(k)fluoranthene		34	ug/L	40	84	40 140		
		benzo(a)pyrene		34	ug/L	40	85	40 140		
		indeno(1,2,3-cd)pyrene		32	ug/L	40	79	40 140		
		dibenzo(a,h)anthracene		31	ug/L	40	77	40 140		
		benzo(g,h,i)perylene		30	ug/L	40	76	40 140		
		2-fluorobiphenyl SUR		67	%			43 116		

Method	QC ID	Parameter	Associated Sample	Result	Units	Amt Added	%R	Limits		RPD	RPD Limit
SW3510C8270E	LCSD12895	naphthalene		24	ug/L	40	59	40	140	7	20
		2-methylnaphthalene		26	ug/L	40	64	40	140	3	20
		acenaphthylene		29	ug/L	40	73	40	140	8	20
		acenaphthene		29	ug/L	40	72	40	140	7	20
		dibenzofuran		30	ug/L	40	74	40	140	8	20
		fluorene		34	ug/L	40	86	40	140	5	20
		phenanthrene		31	ug/L	40	77	40	140	4	20
		anthracene		30	ug/L	40	74	40	140	4	20
		fluoranthene		30	ug/L	40	76	40	140	0	20
		pyrene		37	ug/L	40	93	40	140	9	20
		benzo(a)anthracene		36	ug/L	40	90	40	140	4	20
		chrysene		35	ug/L	40	88	40	140	3	20
		benzo(b)fluoranthene		39	ug/L	40	96	40	140	8	20
		benzo(k)fluoranthene		34	ug/L	40	84	40	140	1	20
		benzo(a)pyrene		35	ug/L	40	87	40	140	3	20
		indeno(1,2,3-cd)pyrene		32	ug/L	40	80	40	140	1	20
		dibenzo(a,h)anthracene		31	ug/L	40	78	40	140	1	20
		benzo(g,h,i)perylene		30	ug/L	40	75	40	140	0	20
		2-fluorobiphenyl SUR		75	%			43	116		

Method	QC ID	Parameter	Associated Sample		Result	Units	Amt Added	%R	Limits		RPD	RPD Limit
SW3540C8082A	BLK12900	PCB-1016		<	0.033	ug/g						
		PCB-1221		<	0.033	ug/g						
		PCB-1232		<	0.033	ug/g						
		PCB-1242		<	0.033	ug/g						
		PCB-1248		<	0.033	ug/g						
		PCB-1254		<	0.033	ug/g						
		PCB-1260		<	0.033	ug/g						
		tetrachloro-m-xylene SUR			66	%			30	150		
		decachlorobiphenyl SUR			69	%			30	150		
SW3540C8082A	LCS12900	PCB-1016			0.29	ug/g	0.333	88	40	140		
		PCB-1221		<	0.033	ug/g						
		PCB-1232		<	0.033	ug/g						
		PCB-1242		<	0.033	ug/g						
		PCB-1248		<	0.033	ug/g						
		PCB-1254		<	0.033	ug/g						
		PCB-1260			0.30	ug/g	0.333	89	40	140		
		tetrachloro-m-xylene SUR			64	%			30	150		
		decachlorobiphenyl SUR			79	%			30	150		
SW3540C8082A	LCSD12900	PCB-1016			0.30	ug/g	0.333	90	40	140	2	30
		PCB-1221		<	0.033	ug/g						
		PCB-1232		<	0.033	ug/g						
		PCB-1242		<	0.033	ug/g						
		PCB-1248		<	0.033	ug/g						
		PCB-1254		<	0.033	ug/g						
		PCB-1260			0.30	ug/g	0.333	89	40	140	0	30
		tetrachloro-m-xylene SUR			64	%			30	150		
		decachlorobiphenyl SUR			73	%			30	150		
SW3540C8082A	MS12900	PCB-1016	53510-002		0.66	ug/g	0.779	85	40	140		
		PCB-1221	53510-002	<	0.078	ug/g						
		PCB-1232	53510-002	<	0.078	ug/g						
		PCB-1242	53510-002	<	0.078	ug/g						
		PCB-1248	53510-002	<	0.078	ug/g						
		PCB-1254	53510-002	<	0.078	ug/g						
		PCB-1260	53510-002		0.62	ug/g	0.779	80	40	140		
		tetrachloro-m-xylene SUR	53510-002		56	%			30	150		
		decachlorobiphenyl SUR	53510-002		61	%			30	150		
SW3540C8082A	MSD12900	PCB-1016	53510-002		0.62	ug/g	0.738	84	40	140	6	30
		PCB-1221	53510-002	<	0.074	ug/g						
		PCB-1232	53510-002	<	0.074	ug/g						
		PCB-1242	53510-002	<	0.074	ug/g						
		PCB-1248	53510-002	<	0.074	ug/g						
		PCB-1254	53510-002	<	0.074	ug/g						
		PCB-1260	53510-002		0.57	ug/g	0.738	77	40	140	9	30
		tetrachloro-m-xylene SUR	53510-002		55	%			30	150		
		decachlorobiphenyl SUR	53510-002		53	%			30	150		

Method	QC ID	Parameter	Associated Sample	Result	Units	Amt Added	%R	Limits		RPD	RPD Limit
SW3546/8081B	BLK12890	alpha-BHC		< 0.040	ug/g						
		beta-BHC		< 0.040	ug/g						
		delta-BHC		< 0.040	ug/g						
		gamma-BHC (Lindane)		< 0.040	ug/g						
		Heptachlor		< 0.040	ug/g						
		Aldrin		< 0.040	ug/g						
		Heptachlor Epoxide		< 0.040	ug/g						
		Endosulfan I		< 0.040	ug/g						
		Dieldrin		< 0.040	ug/g						
		4,4'-DDE		< 0.040	ug/g						
		Endrin		< 0.040	ug/g						
		Endosulfan II		< 0.040	ug/g						
		4,4'-DDD		< 0.040	ug/g						
		Endosulfan Sulfate		< 0.040	ug/g						
		4,4'-DDT		< 0.040	ug/g						
		Methoxychlor		< 0.040	ug/g						
		Endrin Ketone		< 0.040	ug/g						
		Endrin Aldehyde		< 0.040	ug/g						
		alpha-Chlordane		< 0.040	ug/g						
		gamma-Chlordane		< 0.040	ug/g						
		Toxaphene		< 0.20	ug/g						
		tetrachloro-m-xylene SUR		37	%			30	150		
		decachlorobiphenyl SUR		57	%			30	150		
SW3546/8081B	LCS12890	alpha-BHC		0.19	ug/g	0.4	47	40	140		
		beta-BHC		0.20	ug/g	0.4	50	40	140		
		delta-BHC		0.21	ug/g	0.4	53	40	140		
		gamma-BHC (Lindane)		0.19	ug/g	0.4	47	40	140		
		Heptachlor		0.20	ug/g	0.4	49	40	140		
		Aldrin		0.19	ug/g	0.4	47	40	140		
		Heptachlor Epoxide		0.21	ug/g	0.4	53	40	140		
		Endosulfan I		0.21	ug/g	0.4	52	40	140		
		Dieldrin		0.22	ug/g	0.4	54	40	140		
		4,4'-DDE		0.22	ug/g	0.4	56	40	140		
		Endrin		0.23	ug/g	0.4	58	40	140		
		Endosulfan II		0.23	ug/g	0.4	56	40	140		
		4,4'-DDD		0.23	ug/g	0.4	57	40	140		
		Endosulfan Sulfate		0.24	ug/g	0.4	61	40	140		
		4,4'-DDT		0.28	ug/g	0.4	69	40	140		
		Methoxychlor		0.28	ug/g	0.4	71	40	140		
		Endrin Ketone		0.23	ug/g	0.4	58	40	140		
		Endrin Aldehyde		0.20	ug/g	0.4	51	40	140		
		alpha-Chlordane		0.21	ug/g	0.4	54	40	140		
		gamma-Chlordane		0.22	ug/g	0.4	55	40	140		
		Toxaphene		< 0.20	ug/g						
		tetrachloro-m-xylene SUR		45	%			30	150		
		decachlorobiphenyl SUR		65	%			30	150		

Method	QC ID	Parameter	Associated Sample	Result	Units	Amt Added	%R	Limits		RPD	RPD Limit
SW3546/8081B	MS12890	alpha-BHC	53424-019	0.22	ug/g	0.441	49	30	150		
		beta-BHC	53424-019	0.21	ug/g	0.421	49	30	150		
		delta-BHC	53424-019	0.23	ug/g	0.441	53	30	150		
		gamma-BHC (Lindane)	53424-019	0.21	ug/g	0.441	49	30	150		
		Heptachlor	53424-019	0.23	ug/g	0.441	52	30	150		
		Aldrin	53424-019	0.22	ug/g	0.441	49	30	150		
		Heptachlor Epoxide	53424-019	0.23	ug/g	0.441	52	30	150		
		Endosulfan I	53424-019	0.23	ug/g	0.441	52	30	150		
		Dieldrin	53424-019	0.22	ug/g	0.421	53	30	150		
		4,4'-DDE	53424-019	0.26	ug/g	0.441	60	30	150		
		Endrin	53424-019	0.26	ug/g	0.441	58	30	150		
		Endosulfan II	53424-019	0.24	ug/g	0.441	54	30	150		
		4,4'-DDD	53424-019	0.24	ug/g	0.421	57	30	150		
		Endosulfan Sulfate	53424-019	0.26	ug/g	0.441	60	30	150		
		4,4'-DDT	53424-019	0.37	ug/g	0.441	70	30	150		
		Methoxychlor	53424-019	0.30	ug/g	0.441	69	30	150		
		Endrin Ketone	53424-019	0.25	ug/g	0.441	58	30	150		
		Endrin Aldehyde	53424-019	0.22	ug/g	0.441	49	30	150		
		alpha-Chlordane	53424-019	0.23	ug/g	0.441	53	30	150		
		gamma-Chlordane	53424-019	0.23	ug/g	0.441	53	30	150		
		Toxaphene	53424-019	< 0.22	ug/g						
		tetrachloro-m-xylene SUR	53424-019	46	%			30	150		
		decachlorobiphenyl SUR	53424-019	59	%			30	150		
SW3546/8081B	MS12890	alpha-BHC	53510-002	0.49	ug/g	0.97	51	30	150		
		beta-BHC	53510-002	0.46	ug/g	0.97	47	30	150		
		delta-BHC	53510-002	0.53	ug/g	0.97	55	30	150		
		gamma-BHC (Lindane)	53510-002	0.47	ug/g	0.97	49	30	150		
		Heptachlor	53510-002	0.40	ug/g	0.97	41	30	150		
		Aldrin	53510-002	0.47	ug/g	0.97	49	30	150		
		Heptachlor Epoxide	53510-002	0.53	ug/g	0.97	55	30	150		
		Endosulfan I	53510-002	0.52	ug/g	0.97	53	30	150		
		Dieldrin	53510-002	0.52	ug/g	0.97	54	30	150		
		4,4'-DDE	53510-002	0.53	ug/g	0.97	54	30	150		
		Endrin	53510-002	0.56	ug/g	0.97	58	30	150		
		Endosulfan II	53510-002	0.55	ug/g	0.97	57	30	150		
		4,4'-DDD	53510-002	0.62	ug/g	0.97	64	30	150		
		Endosulfan Sulfate	53510-002	0.25	ug/g	0.43	58	30	150		
		4,4'-DDT	53510-002	0.33	ug/g	0.97	34	30	150		
		Methoxychlor	53510-002	0.36	ug/g	0.97	37	30	150		
		Endrin Ketone	53510-002	0.47	ug/g	0.97	49	30	150		
		Endrin Aldehyde	53510-002	0.48	ug/g	0.97	50	30	150		
		alpha-Chlordane	53510-002	0.50	ug/g	0.97	52	30	150		
		gamma-Chlordane	53510-002	0.50	ug/g	0.97	52	30	150		
		Toxaphene	53510-002	< 0.48	ug/g						
		tetrachloro-m-xylene SUR	53510-002	52	%			30	150		
		decachlorobiphenyl SUR	53510-002	51	%			30	150		

Method	QC ID	Parameter	Associated Sample		Result	Units	Amt Added	%R		Limits		RPD		RPD Limit
SW3546/8081B	MSD12890	alpha-BHC	53424-019		0.17	ug/g	0.417	41		30	150	25		30
		beta-BHC	53424-019		0.16	ug/g	0.398	40		30	150	25		30
		delta-BHC	53424-019		0.18	ug/g	0.417	44		30	150	24		30
		gamma-BHC (Lindane)	53424-019		0.17	ug/g	0.417	40		30	150	25		30
		Heptachlor	53424-019		0.18	ug/g	0.417	43		30	150	24		30
		Aldrin	53424-019		0.17	ug/g	0.417	41		30	150	24		30
		Heptachlor Epoxide	53424-019		0.18	ug/g	0.417	44		30	150	22		30
		Endosulfan I	53424-019		0.18	ug/g	0.417	44		30	150	22		30
		Dieldrin	53424-019		0.18	ug/g	0.398	44		30	150	24		30
		4,4'-DDE	53424-019		0.20	ug/g	0.417	49		30	150	26		30
		Endrin	53424-019		0.21	ug/g	0.417	50		30	150	21		30
		Endosulfan II	53424-019		0.19	ug/g	0.417	46		30	150	21		30
		4,4'-DDD	53424-019		0.19	ug/g	0.398	47		30	150	23		30
		Endosulfan Sulfate	53424-019		0.21	ug/g	0.417	51		30	150	21		30
		4,4'-DDT	53424-019		0.30	ug/g	0.417	57		30	150	21		30
		Methoxychlor	53424-019		0.24	ug/g	0.417	58		30	150	23		30
		Endrin Ketone	53424-019		0.21	ug/g	0.417	49		30	150	21		30
		Endrin Aldehyde	53424-019		0.18	ug/g	0.417	42		30	150	20		30
		alpha-Chlordane	53424-019		0.19	ug/g	0.417	44		30	150	23		30
		gamma-Chlordane	53424-019		0.18	ug/g	0.417	43		30	150	25		30
		Toxaphene	53424-019	<	0.21	ug/g		38.059						
		tetrachloro-m-xylene SUR	53424-019		38	%				30	150			
		decachlorobiphenyl SUR	53424-019		50	%				30	150			
SW3546/8081B	MSD12890	alpha-BHC	53510-002		0.33	ug/g	1.006	33		30	150	40	*	30
		beta-BHC	53510-002		0.31	ug/g	1.006	31		30	150	37	*	30
		delta-BHC	53510-002		0.36	ug/g	1.006	36		30	150	38	*	30
		gamma-BHC (Lindane)	53510-002		0.32	ug/g	1.006	32		30	150	40	*	30
		Heptachlor	53510-002		0.27	ug/g	1.006	27	*	30	150	37	*	30
		Aldrin	53510-002		0.33	ug/g	1.006	33		30	150	36	*	30
		Heptachlor Epoxide	53510-002		0.35	ug/g	1.006	35		30	150	41	*	30
		Endosulfan I	53510-002		0.35	ug/g	1.006	35		30	150	38	*	30
		Dieldrin	53510-002		0.36	ug/g	1.006	36		30	150	36	*	30
		4,4'-DDE	53510-002		0.37	ug/g	1.006	37		30	150	35	*	30
		Endrin	53510-002		0.38	ug/g	1.006	38		30	150	38	*	30
		Endosulfan II	53510-002		0.39	ug/g	1.006	38		30	150	36	*	30
		4,4'-DDD	53510-002		0.44	ug/g	1.006	43		30	150	35	*	30
		Endosulfan Sulfate	53510-002		0.39	ug/g	1.006	38		30	150	44	*	30
		4,4'-DDT	53510-002		0.23	ug/g	1.006	23	*	30	150	35	*	30
		Methoxychlor	53510-002		0.27	ug/g	1.006	26	*	30	150	31	*	30
		Endrin Ketone	53510-002		0.33	ug/g	1.006	32		30	150	37	*	30
		Endrin Aldehyde	53510-002		0.34	ug/g	1.006	33		30	150	36	*	30
		alpha-Chlordane	53510-002		0.36	ug/g	1.006	35		30	150	34	*	30
		gamma-Chlordane	53510-002		0.34	ug/g	1.006	34		30	150	38	*	30
		Toxaphene	53510-002	<	0.50	ug/g								
		tetrachloro-m-xylene SUR	53510-002		32	%				30	150			
		decachlorobiphenyl SUR	53510-002		36	%				30	150			

Absolute Resource
associates

Method	QC ID	Parameter	Associated Sample	Result	Units	Amt Added	%R	Limits		RPD	RPD Limit
SW3546/8270E	BLK12899	naphthalene (SIM)		< 0.0050	ug/g						
		2-methylnaphthalene (SIM)		< 0.0050	ug/g						
		acenaphthylene (SIM)		< 0.0050	ug/g						
		acenaphthene (SIM)		< 0.0050	ug/g						
		dibenzofuran (SIM)		< 0.0050	ug/g						
		fluorene (SIM)		< 0.0050	ug/g						
		phenanthrene (SIM)		< 0.0050	ug/g						
		anthracene (SIM)		< 0.0050	ug/g						
		fluoranthene (SIM)		< 0.0050	ug/g						
		pyrene (SIM)		< 0.0050	ug/g						
		benzo(a)anthracene (SIM)		< 0.0050	ug/g						
		chrysene (SIM)		< 0.0050	ug/g						
		benzo(b)fluoranthene (SIM)		< 0.0050	ug/g						
		benzo(k)fluoranthene (SIM)		< 0.0050	ug/g						
		benzo(a)pyrene (SIM)		< 0.0050	ug/g						
		indeno(1,2,3-cd)pyrene (SIM)		< 0.0050	ug/g						
		dibenzo(a,h)anthracene (SIM)		< 0.0050	ug/g						
		benzo(g,h,i)perylene (SIM)		< 0.0050	ug/g						
		nitrobenzene-D5 SUR		61	%			35	114		
		2-fluorobiphenyl SUR		69	%			43	116		
		p-terphenyl-D14 SUR		85	%			33	141		
SW3546/8270E	LCS12899	naphthalene (SIM)		2.3	ug/g	4	57	40	140		
		2-methylnaphthalene (SIM)		2.4	ug/g	4	60	40	140		
		acenaphthylene (SIM)		2.3	ug/g	4	57	40	140		
		acenaphthene (SIM)		2.2	ug/g	4	56	40	140		
		dibenzofuran (SIM)		2.1	ug/g	4	53	40	140		
		fluorene (SIM)		2.2	ug/g	4	56	40	140		
		phenanthrene (SIM)		2.5	ug/g	4	61	40	140		
		anthracene (SIM)		2.4	ug/g	4	60	40	140		
		fluoranthene (SIM)		2.1	ug/g	4	52	40	140		
		pyrene (SIM)		2.7	ug/g	4	69	40	140		
		benzo(a)anthracene (SIM)		2.4	ug/g	4	59	40	140		
		chrysene (SIM)		2.3	ug/g	4	57	40	140		
		benzo(b)fluoranthene (SIM)		2.4	ug/g	4	61	40	140		
		benzo(k)fluoranthene (SIM)		2.3	ug/g	4	59	40	140		
		benzo(a)pyrene (SIM)		2.5	ug/g	4	63	40	140		
		indeno(1,2,3-cd)pyrene (SIM)		2.7	ug/g	4	66	40	140		
		dibenzo(a,h)anthracene (SIM)		2.6	ug/g	4	64	40	140		
		benzo(g,h,i)perylene (SIM)		2.6	ug/g	4	65	40	140		
		nitrobenzene-D5 SUR		66	%			35	114		
		2-fluorobiphenyl SUR		74	%			43	116		
		p-terphenyl-D14 SUR		88	%			33	141		

Method	QC ID	Parameter	Associated Sample	Result	Units	Amt Added	%R	Limits		RPD	RPD Limit
SW3546/8270E	MS12899	naphthalene (SIM)	53510-002	4.8	ug/g	10.4	46	40	140		
		2-methylnaphthalene (SIM)	53510-002	5.2	ug/g	10.4	50	40	140		
		acenaphthylene (SIM)	53510-002	5.0	ug/g	10.4	47	40	140		
		acenaphthene (SIM)	53510-002	4.9	ug/g	10.4	47	40	140		
		dibenzofuran (SIM)	53510-002	4.6	ug/g	10.4	44	40	140		
		fluorene (SIM)	53510-002	5.0	ug/g	10.4	48	40	140		
		phenanthrene (SIM)	53510-002	5.7	ug/g	10.4	49	40	140		
		anthracene (SIM)	53510-002	5.1	ug/g	10.4	48	40	140		
		fluoranthene (SIM)	53510-002	5.6	ug/g	10.4	44	40	140		
		pyrene (SIM)	53510-002	5.9	ug/g	10.4	48	40	140		
		benzo(a)anthracene (SIM)	53510-002	5.0	ug/g	10.4	45	40	140		
		chrysene (SIM)	53510-002	5.0	ug/g	10.4	43	40	140		
		benzo(b)fluoranthene (SIM)	53510-002	5.2	ug/g	10.4	45	40	140		
		benzo(k)fluoranthene (SIM)	53510-002	4.9	ug/g	10.4	43	40	140		
		benzo(a)pyrene (SIM)	53510-002	5.3	ug/g	10.4	46	40	140		
		indeno(1,2,3-cd)pyrene (SIM)	53510-002	5.1	ug/g	10.4	46	40	140		
		dibenzo(a,h)anthracene (SIM)	53510-002	4.8	ug/g	10.4	45	40	140		
		benzo(g,h,i)perylene (SIM)	53510-002	5.1	ug/g	10.4	45	40	140		
		nitrobenzene-D5 SUR	53510-002	53	%			35	114		
		2-fluorobiphenyl SUR	53510-002	58	%			43	116		
		p-terphenyl-D14 SUR	53510-002	62	%			33	141		
SW3546/8270E	MSD12899	naphthalene (SIM)	53510-002	4.8	ug/g	10.2	46	40	140	1	30
		2-methylnaphthalene (SIM)	53510-002	5.3	ug/g	10.2	51	40	140	1	30
		acenaphthylene (SIM)	53510-002	5.1	ug/g	10.2	48	40	140	1	30
		acenaphthene (SIM)	53510-002	5.0	ug/g	10.2	48	40	140	1	30
		dibenzofuran (SIM)	53510-002	4.7	ug/g	10.2	46	40	140	2	30
		fluorene (SIM)	53510-002	5.1	ug/g	10.2	49	40	140	2	30
		phenanthrene (SIM)	53510-002	5.9	ug/g	10.2	51	40	140	3	30
		anthracene (SIM)	53510-002	5.4	ug/g	10.2	51	40	140	5	30
		fluoranthene (SIM)	53510-002	5.7	ug/g	10.2	46	40	140	3	30
		pyrene (SIM)	53510-002	6.1	ug/g	10.2	50	40	140	2	30
		benzo(a)anthracene (SIM)	53510-002	5.3	ug/g	10.2	48	40	140	6	30
		chrysene (SIM)	53510-002	5.3	ug/g	10.2	46	40	140	4	30
		benzo(b)fluoranthene (SIM)	53510-002	5.7	ug/g	10.2	51	40	140	9	30
		benzo(k)fluoranthene (SIM)	53510-002	5.0	ug/g	10.2	44	40	140	2	30
		benzo(a)pyrene (SIM)	53510-002	5.6	ug/g	10.2	50	40	140	6	30
		indeno(1,2,3-cd)pyrene (SIM)	53510-002	5.5	ug/g	10.2	51	40	140	7	30
		dibenzo(a,h)anthracene (SIM)	53510-002	5.2	ug/g	10.2	50	40	140	8	30
		benzo(g,h,i)perylene (SIM)	53510-002	5.5	ug/g	10.2	50	40	140	7	30
		nitrobenzene-D5 SUR	53510-002	52	%			35	114		
		2-fluorobiphenyl SUR	53510-002	59	%			43	116		
		p-terphenyl-D14 SUR	53510-002	64	%			33	141		

Method	QC ID	Parameter	Associated Sample	Result	Units	Amt Added	%R	Limits		RPD	RPD Limit
SW3005A6020A	BLK12902	Silver		< 0.0050	mg/L						
		Arsenic		< 0.0050	mg/L						
		Barium		< 0.010	mg/L						
		Cadmium		< 0.0010	mg/L						
		Chromium		< 0.010	mg/L						
		Lead		< 0.0050	mg/L						
		Selenium		< 0.010	mg/L						
SW3005A6020A	DUP12902	Lead	53424-035	0.37	mg/L					2	20
SW3005A6020A	LCS12902	Silver		0.25	mg/L	0.25	101	80	120		
		Arsenic		0.47	mg/L	0.5	93	80	120		
		Barium		0.50	mg/L	0.5	100	80	120		
		Cadmium		0.50	mg/L	0.5	100	80	120		
		Chromium		0.46	mg/L	0.5	92	80	120		
		Lead		0.54	mg/L	0.5	108	80	120		
		Selenium		0.45	mg/L	0.5	90	80	120		
SW3005A6020A	LCSD12902	Silver		0.26	mg/L	0.25	104	80	120	3	20
		Arsenic		0.47	mg/L	0.5	94	80	120	1	20
		Barium		0.51	mg/L	0.5	103	80	120	3	20
		Cadmium		0.51	mg/L	0.5	102	80	120	2	20
		Chromium		0.46	mg/L	0.5	92	80	120	0	20
		Lead		0.55	mg/L	0.5	109	80	120	1	20
		Selenium		0.46	mg/L	0.5	92	80	120	2	20
SW3005A6020A	MS12902	Lead	53424-035	5.0	mg/L	5	93	75	125		

Method	QC ID	Parameter	Associated Sample		Result	Units	Amt Added	%R		Limits		RPD	RPD Limit
SW3051A6020A	BLK12903	Silver		<	2.5	ug/g							
		Arsenic		<	2.5	ug/g							
		Barium		<	5.0	ug/g							
		Cadmium		<	0.50	ug/g							
		Chromium		<	5.0	ug/g							
		Lead		<	2.5	ug/g							
		Selenium		<	5.0	ug/g							
SW3051A6020A	CRM12903	Silver			39.2	ug/g	57.3			34.6	64.3		
		Arsenic			83.2	ug/g	126			73.6	139		
		Barium			174	ug/g	223			139	245		
		Cadmium			73.4	ug/g	106			66.6	116		
		Chromium			124	ug/g	178			105	196		
		Lead			199	ug/g	248			152	273		
		Selenium			125	ug/g	196			111	217		
SW3051A6020A	CRMD12903	Silver			38.8	ug/g	57.3			34.6	64.3	1	20
		Arsenic			82.2	ug/g	126			73.6	139	1	20
		Barium			177	ug/g	223			139	245	2	20
		Cadmium			72.4	ug/g	106			66.6	116	1	20
		Chromium			125	ug/g	178			105	196	1	20
		Lead			197	ug/g	248			152	273	1	20
		Selenium			121	ug/g	196			111	217	3	20
SW3051A6020A	MS12903	Silver	53510-002		310	ug/g	313	99		75	125		
		Arsenic	53510-002		470	ug/g	627	73	*	75	125		
		Barium	53510-002		830	ug/g	627	115		75	125		
		Cadmium	53510-002		600	ug/g	627	95		75	125		
		Chromium	53510-002		560	ug/g	627	83		75	125		
		Lead	53510-002		700	ug/g	627	102		75	125		
		Selenium	53510-002		420	ug/g	627	67	*	75	125		
SW3051A6020A	MSD12903	Silver	53510-002		280	ug/g	297	93		75	125	12	20
		Arsenic	53510-002		460	ug/g	595	75		75	125	3	20
		Barium	53510-002		720	ug/g	595	102		75	125	14	20
		Cadmium	53510-002		520	ug/g	595	87		75	125	14	20
		Chromium	53510-002		540	ug/g	595	85		75	125	3	20
		Lead	53510-002		640	ug/g	595	98		75	125	8	20
		Selenium	53510-002		400	ug/g	595	67	*	75	125	5	20
SW7470A	BLK12911	Mercury		<	0.00020	mg/L							
SW7470A	DUP12911	Mercury	53510-008	<	0.00020	mg/L							20
SW7470A	LCS12911	Mercury			0.0022	mg/L	0.002	109		80	120		
SW7470A	LCSD12911	Mercury			0.0021	mg/L	0.002	106		80	120	2	20
SW7470A	MS12911	Mercury	53510-008		0.0022	mg/L	0.002	113		80	120		

Method	QC ID	Parameter	Associated Sample	Result	Units	Amt Added	%R	Limits		RPD	RPD Limit
SW7471B	BLK12925	Mercury		< 0.032	ug/g						
SW7471B	CRM12925	Mercury		0.231	ug/g	0.221		0.0908	0.351		
SW7471B	CRMD12925	Mercury		0.234	ug/g	0.221		0.0908	0.351	1	35
SW7471B	MS12925	Mercury	53510-002	1.8	ug/g	0.83	80	80	120		
SW7471B	MSD12925	Mercury	53510-002	1.7	ug/g	0.75	81	80	120	3	35

Method	QC ID	Parameter	Associated Sample	Result	Units	Amt Added	%R	Limits		RPD	RPD Limit
ASTMD359002A	CCVB2002784	Total Kjeldahl Nitrogen (TKN)		5.1	mg/L	5	101	80	120		
ASTMD359002A	CCVE2002784	Total Kjeldahl Nitrogen (TKN)		9.1	mg/L	10	91	80	120		
ASTMD359002A	LCS2002784	Total Kjeldahl Nitrogen (TKN)		9.1	mg/L	10	91	80	120		
ASTMD359002A	LCSD2002784	Total Kjeldahl Nitrogen (TKN)		9.9	mg/L	10	99	80	120	8	25
ASTMD359002A	MS2002784	Total Kjeldahl Nitrogen (TKN)	53510-002	6100	mg/L	3125	87	80	120		
ASTMD359002A	MSD2002784	Total Kjeldahl Nitrogen (TKN)	53510-002	8400	mg/L	4688	107	80	120	32 *	25
ASTMD359002A	PB2002784	Total Kjeldahl Nitrogen (TKN)		< 0.5	mg/L						
E300.0A	BLK2002766	Nitrate-N		< 0.1	mg/L						
		Nitrite-N		< 0.1	mg/L						
E300.0A	DUP2002766	Nitrate-N	53526-001	0.1	mg/L					1	10
		Nitrite-N	53526-001	< 0.1	mg/L						10
E300.0A	LCS2002766	Nitrate-N		9.1	mg/L	10	91	90	110		
		Nitrite-N		14	mg/L	15	94	90	110		
E300.0A	LCSD2002766	Nitrate-N		9.1	mg/L	10	91	90	110	1	10
		Nitrite-N		14	mg/L	15	94	90	110	0	10
E300.0A	MS2002766	Nitrate-N	53526-001	1.6	mg/L	1.66	88 *	90	110		
		Nitrite-N	53526-001	2.3	mg/L	2.53	91	90	110		
E365.3	LCS2002795	Total Phosphorus as P		0.24	mg/L	0.2	120	75	125		
E365.3	LCSD2002795	Total Phosphorus as P		0.20	mg/L	0.2	99	75	125	20	20
E365.3	MS2002795	Total Phosphorus as P	53605-003	0.29	mg/L	0.2	103	75	125		
E365.3	MS2002795	Total Phosphorus as P	53635-001	0.50	mg/L	0.2	104	75	125		
E365.3	MSD2002795	Total Phosphorus as P	53605-003	0.29	mg/L	0.2	103	75	125	0	10
E365.3	MSD2002795	Total Phosphorus as P	53635-001	0.49	mg/L	0.2	99	75	125	2	10
E365.3	PB2002795	Total Phosphorus as P		< 0.01	mg/L						

PAGE ____ OF ____

Absolute Resource associates

124 Heritage Avenue #16
Portsmouth, NH 03801
603-436-2001
absoluteresourceassociates.com

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

53510

Company Name: VHB
Company Address: 2 Bedford Farm Drive, Bedford, NH
Report To: Rene Nahlik
Phone #: 603-391-3993
Invoice to:
Email: Rnahlik@vhb.com
PO #:

Project Name: Mill Pond
Project #: 52633
Project Location: [✓ NH] MA ME VT ______
Accreditation Required? N/Y: ______
Protocol: RCRA SDWA NPDES MCP NHDES DOD
Reporting Limits: QAPP GW-1 S-1 EPA DW Other______
Quote # ______
☐ NH Reimbursement Pricing

Lab Sample ID (Lab Use Only)	Field ID	# CONTAINERS	Matrix: WATER	Matrix: SOLID	Matrix: OTHER	Preservation Method: HCl	Preservation Method: HNO_3	Preservation Method: H_2SO_4	Preservation Method: NaOH	Preservation Method: MeOH	Sampling: DATE	Sampling: TIME	Sampling: SAMPLER
53510-01	SED-13	5		X							6/23/20	1200	AR
-02	SED-16	5		X								1300	AR
-02MS	SED-16 MS	3		X								1300	AR
-02MSD	SED-16 MSD	3		X								1300	AR
-03	SED-DP	4		X								1250	AR
-04	SED-14	5		X								1100	AR
-05	SED-15	5		X								1000	AR
-06	SED-17	5		X								1600	AR
-07	SED-18	5		X								1500	AR
-08	SED-FB	2	X				X					1630	AR

ANALYSIS REQUEST

Lab Sample ID	☐ VOC 8260 ☐ VOC 8260 NHDES ☐ VOC 8260 MADEP	☐ VOC 624.1 ☐ VOC BTEX MtBE, only ☐ VOC 8021VT	☐ VPH MADEP ☐ GRO 8015 ☐ 1,4-Dioxane	☐ VOC 524.2 ☐ VOC 524.2 NH List ☐ Gases-List:	☐ TPH ☐ DRO 8015 ☐ EPH MADEP ☐ TPH Fingerprint	☒ 8270PAH ☐ 8270ABN ☐ 625.1 ☐ EDB SIM	☒ 8082 PCB ☒ 8081 Pesticides ☐ 608.3 Pest/PCB	☐ PFAS 537.1	☐ O&G 1664 ☐ Mineral O&G 1664	☐ pH ☐ BOD ☐ Conductivity ☐ Turbidity ☐ Apparent Color	☐ TSS ☐ TDS ☐ TS ☐ TVS ☐ Alkalinity ☐ Acidity	☒ RCRA Metals ☐ Priority Pollutant Metals ☐ TAL Metals ☐ Hardness	☐ Total Metals-list:	☐ Dissolved Metals-list:	☐ Ammonia ☐ COD ☐ TKN ☐ TN ☐ TON ☒ TOC ☐ Ferrous Iron	☒ T-Phosphorus ☐ Bacteria P/A ☐ Bacteria MPN ☐ Enterococci	☐ Cyanide ☐ Sulfide ☐ Nitrate + Nitrite ☐ Ortho P ☐ Phenols	☐ Nitrate ☐ Nitrite ☐ Chloride ☐ Sulfate ☐ Bromide ☐ Fluoride	☐ Corrosivity ☐ Ignitibility/FP	☐ TCLP Metals ☐ TCLP VOC ☐ TCLP SVOC ☐ TCLP Pesticide	Subcontract: ☒ Grain Size ☐ Herbicides ☐ Asbestos	Total Nitrogen	Matrix Spike / Matrix Spike Dup	Grab (G) or Composite (C)
53510-01						X	X					X			X	X					X	X		C
-02						X	X					X			X	X					X	X		C
-02MS						X	X					X											X	C
-02MSD						X	X					X											X	C
-03						X	X					X			X	X						X		C
-04						X	X					X			X	X					X	X		C
-05						X	X					X			X	X					X	X		C
-06						X	X					X			X	X					X	X		C
-07						X	X					X			X	X					X	X		C
-08						X						X												

TAT REQUESTED
Priority (24 hr)* ☐
Expedited (48 hr)* ☐
Standard (10 Business Days) ☒
*Date Needed______

See absoluteresourceassociates.com for sample acceptance policy and current accreditation lists.

SPECIAL INSTRUCTIONS

REPORTING INSTRUCTIONS ☐ PDF (e-mail address)______
☐ HARD COPY REQUIRED ☐ EDD______

RECEIVED ON ICE ☒ YES ☐ NO
TEMPERATURE 10 °C

CUSTODY RECORD

Relinquished by Sampler:	Date	Time	Received by:	Date	Time
	6/23	1700			

Relinquished by:	Date	Time	Received by:	Date	Time

Relinquished by:	Date	Time	Received by Laboratory:	Date	Time
				6/23/20	1700

QSD-01 Revision 03/09/2020

Appendix E:
Natural Resource Agency Coordination

CONFIDENTIAL – NH Dept. of Environmental Services review

Memo

NH NATURAL HERITAGE BUREAU
NHB DATACHECK RESULTS LETTER

To: Andrew Mahoney, VHB
200 Bedford Farms Drive
Bedford, NH 03103

From: Amy Lamb, NH Natural Heritage Bureau
Date: 9/11/2020 (valid for one year from this date)
Re: Review by NH Natural Heritage Bureau
NHB File ID: NHB20-2530 Town: Durham Location: The Mill Pond Dam and its impoundment area
Description: This project consists of a feasibility study for the potential removal of the Oyster River/Mill Pond Dam in Durham, NH, and the impacts of a dam removal to the surrounding impoundment area.
cc: Kim Tuttle

As requested, I have searched our database for records of rare species and exemplary natural communities, with the following results.

Comments: NHB recommends surveys for the rare plant species listed below, in order to assess the current status of the populations, and the potential impacts of the drawdown on plant communities. Surveys should occur at least where plants were previously documented within Mill Pond, but preferably throughout the area of drawdown influence.

Natural Community	State[1]	Federal	Notes
Sparsely vegetated intertidal system	--	--	Threats to these communities are primarily alterations to the hydrology of the wetland (such as alterations that might affect the sheet flow of tidal waters across the intertidal flat) and increased input of nutrients and pollutants in storm runoff.

Plant species	State[1]	Federal	Notes
arctic bur-reed (*Sparganium natans*)*	T	--	
Beck's water-marigold (*Bidens beckii*)*	T	--	Threats to aquatic species include changes in water quality, e.g., due to pollution and stormwater runoff, and significant changes in water level.
great bur-reed (*Sparganium eurycarpum*)*	T	--	Threats to aquatic species include changes in water quality, e.g., due to pollution and stormwater runoff, and significant changes in water level.
ivy-leaved duckweed (*Lemna trisulca*)*	E	--	Threats to aquatic species include changes in water quality, e.g., due to pollution and stormwater runoff, and significant changes in water level.
lake quillwort (*Isoetes lacustris*)*	E	--	
marsh horsetail (*Equisetum palustre*)*	E	--	This wetland species, which occurs in marshes and wet meadows, would be

threatened by changes to local hydrology, including increased nutrient input from stormwater runoff, and sedimentation from nearby disturbance. It also occurs on river and streambanks, where the primary threats would be direct destruction of plants or their habitat.

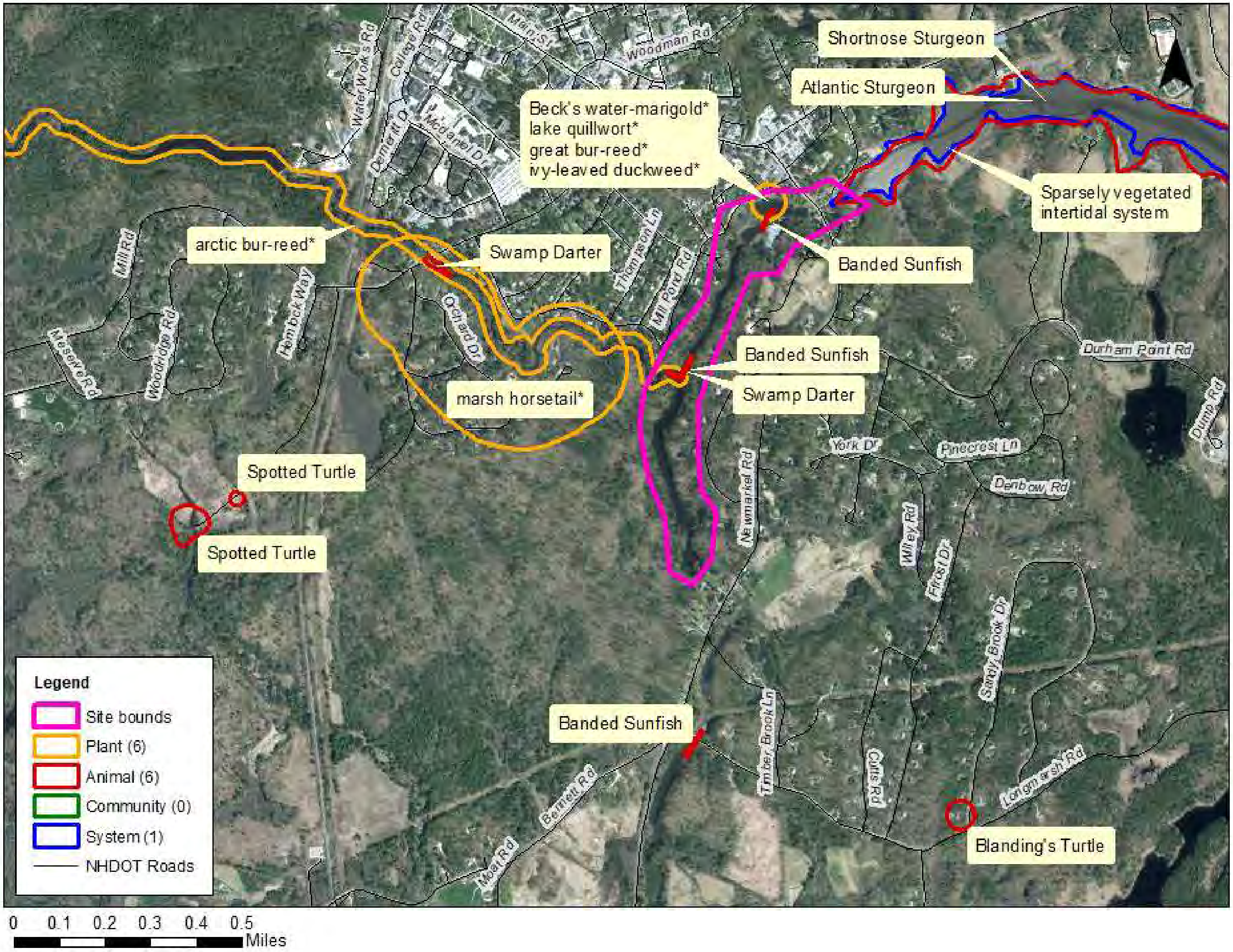
Vertebrate species	**State**[1]	**Federal**	**Notes**
Atlantic Sturgeon (*Acipenser oxyrinchus*)	T	T	Contact the NH Fish & Game Dept and the US Fish & Wildlife Service (see below).
Banded Sunfish (*Enneacanthus obesus*)	SC	--	Contact the NH Fish & Game Dept (see below).
Blanding's Turtle (*Emydoidea blandingii*)	E	--	Contact the NH Fish & Game Dept (see below).
Shortnose Sturgeon (*Acipenser brevirostrum*)	E	E	Contact the NH Fish & Game Dept and the US Fish & Wildlife Service (see below).
Spotted Turtle (*Clemmys guttata*)	T	--	Contact the NH Fish & Game Dept (see below).
Swamp Darter (*Etheostoma fusiforme*)	SC	--	Contact the NH Fish & Game Dept (see below).

[1] Codes: "E" = Endangered, "T" = Threatened, “SC” = Special Concern, "--" = an exemplary natural community, or a rare species tracked by NH Natural Heritage that has not yet been added to the official state list. An asterisk (*) indicates that the most recent report for that occurrence was more than 20 years ago.

Contact for all animal reviews: Kim Tuttle, NH F&G, (603) 271-6544.

A negative result (no record in our database) does not mean that a sensitive species is not present. Our data can only tell you of known occurrences, based on information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed for certain species. An on-site survey would provide better information on what species and communities are indeed present.

NHB20-2530


Shortnose Sturgeon
Atlantic Sturgeon
Beck's water-marigold*
lake quillwort*
great bur-reed*
ivy-leaved duckweed*
Sparsely vegetated intertidal system
arctic bur-reed*
Swamp Darter
Banded Sunfish
Banded Sunfish
Swamp Darter
marsh horsetail*
Spotted Turtle
Spotted Turtle
Banded Sunfish
Blanding's Turtle
Water Works Rd
College Rd
Main St
Woodman Rd
Dennett Dr
McDaniel Dr
Thompson Ln
Mill Pond Rd
Mill Rd
Hemlock Way
Orchard Dr
Meserve Rd
Woodridge Rd
Durham Point Rd
Dame Rd
York Dr
Pinecrest Ln
Denbow Rd
Newmarket Rd
Wiley Rd
Frost Dr
Sandy Brook Dr
Timber Brook Ln
Curtis Rd
Longmarsh Rd
Bennett Rd
Mast Rd
Legend
Site bounds
Plant (6)
Animal (6)
Community (0)
System (1)
NHDOT Roads
0
0.1
0.2
0.3
0.4
0.5
Miles

New Hampshire Natural Heritage Bureau - System Record

Sparsely vegetated intertidal system

Legal Status		**Conservation Status**	
Federal:	Not listed	Global:	Not ranked (need more information)
State:	Not listed	State:	Rare or uncommon

Description at this Location

Conservation Rank: Good quality, condition and landscape context ('B' on a scale of A-D).
Comments on Rank: --

Detailed Description: Extensive ***intertidal flats*** that are exposed daily at low tide, bordered in places by ***intertidal rocky shore*** and ***coastal shoreline strand/swale*** communities.
General Area: 2010: Borders **salt marsh system** landward and **subtidal system** seaward.
General Comments: --
Management Comments: --

Location

Survey Site Name: Great Bay
Managed By: Moody Point Open Space

County: Rockingham
Town(s): Newington
Size: 3589.5 acres
Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: Occurs throughout Great Bay from the mouths of its tributaries, through Little Bay, to the confluence with the Piscataqua River.

Dates documented

First reported: 1997-06-23
Last reported: 2010-10-13

New Hampshire Natural Heritage Bureau - Plant Record

arctic bur-reed (*Sparganium natans*)

Legal Status		**Conservation Status**	
Federal:	Not listed	Global:	Demonstrably widespread, abundant, and secure
State:	Listed Threatened	State:	Imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Not ranked
Comments on Rank: --

Detailed Description: 1965: Specimen collected.
General Area: 1965: In 1-18 inches of water.
General Comments: --
Management Comments: --

Location

Survey Site Name: Oyster River
Managed By:

County: Strafford
Town(s): Durham
Size: 64.8 acres Elevation:

Precision: Within 1.5 miles of the area indicated on the map (location information is vague or uncertain).

Directions: 1965: Oyster River, Durham.

Dates documented

First reported: 1965-10-14 Last reported: 1965-10-14

New Hampshire Natural Heritage Bureau - Plant Record

Beck's water-marigold (*Bidens beckii*)

Legal Status		**Conservation Status**	
Federal:	Not listed	Global:	Demonstrably widespread, abundant, and secure
State:	Listed Threatened	State:	Imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Not ranked
Comments on Rank: --

Detailed Description: 1995: Extremely abundant (in an area to be impacted by vegetation removal). 3+ other populations identified upstream. 1972: Lasky specimen at FF. 1965: Gruencking specimen at UNH.
General Area: In 3 inches of water.
General Comments: --
Management Comments: 1995: Mechanical removal of submerged and floating-leaved vegetation planned. Crow recommends retaining small patches of *M. beckii*. Upstream searches confirmed presence of other populations providing potential for natural revegetation.

Location

Survey Site Name: Mill Pond
Managed By: Mill Pond

County: Strafford
Town(s): Durham
Size: 2.8 acres
Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: Oyster River, just west of Rte. 108 in Durham.

Dates documented

First reported: 1965
Last reported: 1995-07-10

CONFIDENTIAL – NH Dept. of Environmental Services review

New Hampshire Natural Heritage Bureau - Plant Record

great bur-reed (*Sparganium eurycarpum*)

Legal Status		**Conservation Status**	
Federal:	Not listed	Global:	Demonstrably widespread, abundant, and secure
State:	Listed Threatened	State:	Imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Not ranked
Comments on Rank: --

Detailed Description: 1997: No details provided
General Area: 1995: Oyster River.
General Comments: --
Management Comments: Do not remove aquatic vegetation in the area between the point on the peninsula and the "islands".

Location

Survey Site Name: Mill Pond
Managed By: Mill Pond

County: Strafford
Town(s): Durham
Size: 2.8 acres
Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: Mill Pond, Oyster River, just west of Route 108 in Durham. At the tip of the peninsula, out into the water and again along the near side of the "woody shrub islands".

Dates documented

First reported: 1995-07-10
Last reported: 1995-07-10

New Hampshire Natural Heritage Bureau - Plant Record

ivy-leaved duckweed (*Lemna trisulca*)

Legal Status		**Conservation Status**	
Federal:	Not listed	Global:	Demonstrably widespread, abundant, and secure
State:	Listed Endangered	State:	Critically imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank:	Not ranked
Comments on Rank:	--
Detailed Description:	1998: Species observed. 1995: Not greatly abundant but widely scattered through the shallower waters of Mill Pond. 1961: Specimen collected. 1958: Specimen collected. 1956: Specimen collected. 1942: Specimen collected.
General Area:	1995: Oyster River. 1961: Oyster River, Durham (Mill Pond) on bottom in 1 ft. water, very thick. 1958: Floating in 1-2 ft. water edge of Oyster River above dam. 1956: Quiet, muddy organic water. 1942: Above dam in shallow water.
General Comments:	--
Management Comments:	Unknown date: Mechanical removal of aquatic vegetation expected to have little overall impact due to vigorous vegetative reproduction.

Location

Survey Site Name: Mill Pond
Managed By: Mill Pond

County: Strafford
Town(s): Durham
Size: 2.8 acres
Elevation:

Precision: Within 1.5 miles of the area indicated on the map (location information is vague or uncertain).

Directions: Mill Pond, Oyster River, just west of Route 108 in Durham above dam in shallow water.
1956: Oyster River, Laundry Pond.

Dates documented

First reported: 1942-06-09
Last reported: 1998

New Hampshire Natural Heritage Bureau - Plant Record

lake quillwort (*Isoetes lacustris*)

Legal Status		**Conservation Status**	
Federal:	Not listed	Global:	Demonstrably widespread, abundant, and secure
State:	Listed Endangered	State:	Not ranked (need more information)

Description at this Location

Conservation Rank:	Historical records only - current condition unknown.
Comments on Rank:	--
Detailed Description:	1995: Crow fails to relocate. Speculates that Aquascreen panels installed in 1981 may have eliminated the plant from the area. 1978: Specimen of Crow at NEBC.
General Area:	--
General Comments:	--
Management Comments:	--

Location

Survey Site Name: Mill Pond
Managed By:

County: Strafford
Town(s): Durham
Size: 2.8 acres Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: Mill Pond, Oyster River, just west of Rte 108 in Durham.

Dates documented

First reported: 1978 Last reported: 1978-09

New Hampshire Natural Heritage Bureau - Plant Record

marsh horsetail (*Equisetum palustre*)

Legal Status		**Conservation Status**	
Federal:	Not listed	Global:	Demonstrably widespread, abundant, and secure
State:	Listed Endangered	State:	Not ranked (need more information)

Description at this Location

Conservation Rank:	Not ranked
Comments on Rank:	--
Detailed Description:	1973: Herbarium specimen (#55,628) of Chapman at NHA.
General Area:	1973: Full sun, sandy soil.
General Comments:	1973: Generally without evidence of fertile stems on ground beneath.
Management Comments:	--

Location

Survey Site Name:	Orchard Drive
Managed By:	Oyster River School District

County:	Strafford		
Town(s):	Durham		
Size:	105.4 acres	Elevation:	

Precision: Within 1.5 miles of the area indicated on the map (location information is vague or uncertain).

Directions: Durham. Along side of Orchard Drive.

Dates documented

First reported:	1973-05-23	Last reported:	1973-05-23

New Hampshire Natural Heritage Bureau - Animal Record

Atlantic Sturgeon (*Acipenser oxyrinchus*)

Legal Status		**Conservation Status**	
Federal:	Listed Threatened	Global:	Rare or uncommon
State:	Listed Threatened	State:	Critically imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Not ranked

Comments on Rank: --

Detailed Description: 2016: 1 individual, sex unknown, detected in the lower Piscataqua River.
2015: 1 individual, sex unknown, detected in Portsmouth Harbor.
2012: 1 individual, sex unknown, detected in Little Bay.

General Area: 2016: Tidal waters in Portsmouth Harbor, Little Bay, and the Piscataqua River.

General Comments: --

Management Comments: --

Location

Survey Site Name: Piscataqua River

Managed By:

County:

Town(s): Out-Of-State

Size: 7749.3 acres Elevation:

Precision: Within 1.5 miles of the area indicated on the map (location information is vague or uncertain).

Directions: 2016: Tidal waters of Portsmouth Harbor, Little Bay, and the Piscataqua River.

Dates documented

First reported: 2012-06-02 Last reported: 2016-05-27

The U.S. Fish & Wildlife Service has jurisdiction over Federally listed species. Please contact them at 70 Commercial Street, Suite 300, Concord NH 03301 or at (603) 223-2541.

New Hampshire Natural Heritage Bureau - Animal Record

Banded Sunfish (*Enneacanthus obesus*)

Legal Status		**Conservation Status**	
Federal:	Not listed	Global:	Demonstrably widespread, abundant, and secure
State:	Special Concern	State:	Rare or uncommon

Description at this Location

Conservation Rank:	Not ranked
Comments on Rank:	--
Detailed Description:	2007: Area 12259: 2 observed.2005: Area 8991: 3 observed. Area 8989: 1 observed. Area 8990: 1 observed. Area 8992: 3 observed. Area 8981: 2 observed. 1985: 3 observed, age and sex unknown (Obs_id 384).
General Area:	2007: Area 12259: Vegetation along the margins of small stream channels flowing through abandoned beaver impoundments.2005: Areas 8991, 8989, 8990, 8992, and 8981: Freshwater - stream or river. 1985: Freshwater - stream or river (Obs_id 384).
General Comments:	1985: 3 BDS (85,70,68 mm.) sampled by electrofishing at NHFG Fishing for the Future index site ST285030. Index site is 300 ft.long (Obs_id 384).
Management Comments:	--

Location

Survey Site Name: Oyster River
Managed By: NRCS_WRP_Brisson

County: Strafford
Town(s): Barrington
Size: 5.2 acres Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2007: Area 12259: Upper Oyster River, downstream of Glass Road (dirt road heading south off of Rt 4) at eastern inlet to abandoned beaver impoundment.2005: Area 8991: Oyster River SW of the Lee traffic circle. Area 8989: Oyster River at Sheep Rd. just N of Rte 4. Area 8990: Oyster River just W of New Market Rd. Area 8992: Oyster River W of New Market Rd. Area 8981:Longmarsh Brook at the crossing with Longmarsh Rd. 1985: Oyster River at Rte.155A between Rte.4 and Lee Five Corners (Obs_id 384).

Dates documented

First reported: 1985-07-05 Last reported: 2007-07-13

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

New Hampshire Natural Heritage Bureau - Animal Record

Blanding's Turtle (*Emydoidea blandingii*)

Legal Status		**Conservation Status**	
Federal:	Not listed	Global:	Apparently secure but with cause for concern
State:	Listed Endangered	State:	Critically imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank:	Not ranked
Comments on Rank:	--
Detailed Description:	2006: Area 11524: 1 female adult turtle, 4 nestlings observed.
General Area:	2006: Area 11524: Nested in flower bed, hatchlings found in driveway.
General Comments:	2006: Area 11524: Email with details and photos at NHFG.
Management Comments:	--

Location

Survey Site Name: Crommet Creek
Managed By:

County: Strafford
Town(s): Durham
Size: 1.9 acres
Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2006: Area 11524: Found in driveway or 5 Sandy Brook Drive.

Dates documented

First reported: 2006-08-20 Last reported: 2006-08-20

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

New Hampshire Natural Heritage Bureau - Animal Record

Shortnose Sturgeon (*Acipenser brevirostrum*)

Legal Status		**Conservation Status**	
Federal:	Listed Endangered	Global:	Rare or uncommon
State:	Listed Endangered	State:	Critically imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank:	Not ranked
Comments on Rank:	--
Detailed Description:	2016: 2 individuals, 1 female and 1 sex unknown, detected in Portsmouth Harbor and the lower Piscataqua River. 2015: 3 females and 2 other individuals, sex unknown detected in Portsmouth Harbor. 2014: 1 female detected moving from Portsmouth Harbor up the Piscataqua River to the mouth of the Cocheco River. 2012: 1 female detected in Little Bay. 2011: 1 female detected in Little Bay. 2010: 1 female detected in Little Bay.
General Area:	2016: Tidal waters in Portsmouth Harbor, Little Bay, and the Piscataqua River.
General Comments:	--
Management Comments:	--

Location

Survey Site Name: Piscataqua River
Managed By:

County:
Town(s): Out-Of-State
Size: 7749.3 acres Elevation:

Precision: Within 1.5 miles of the area indicated on the map (location information is vague or uncertain).

Directions: 2016: Tidal waters of Portsmouth Harbor, Little Bay, and the Piscataqua River.

Dates documented

First reported: 2010-11-03 Last reported: 2016-10-20

The U.S. Fish & Wildlife Service has jurisdiction over Federally listed species. Please contact them at 70 Commercial Street, Suite 300, Concord NH 03301 or at (603) 223-2541.