BOSTON GROUNDWATER TRUST (BGwT)
BOARD MEETING
March 29, 2016

The Board of Trustees of the Boston Groundwater Trust held its meeting at the Boston Common Hotel & Conference Center, 40 Trinity Place, room #305. The Executive Director posted a meeting notice at Boston City Hall in accordance with provisions of the Commonwealth of Massachusetts' Open Meeting Law. Mr. Mitchell, co-chair, called the meeting to order at 4:09 pm. The following trustees were present:

Mr. Tim Mitchell, Neighborhood Association of the Back Bay
Mr. Gary Saunders, Boston Back Bay Association
Mr. John Hemenway, Beacon Hill Civic Association
Ms. Janine Commerford, Greater Boston Real Estate Board
Ms. Lisa Soli, Fenway Community Development Corporation
Mr. Greg Galer, the Boston Preservation Alliance

Also present:

Mr. Christian Simonelli, Executive Director; Ms. Mohona Siddique, Neighborhood Liaison at the Office of Boston City Councilor Josh Zakim; Mr. Anthony Gilardi, Chief of Staff to Trustee Blackmon; Mr. Patrick Lyons; Legislative Aide to Trustee Michlewitz

1. **Adoption of the minutes of the January 14th, 2016 Meeting**

   Minutes were previously electronically distributed to board members for review. Discussion followed. Mr. Galer, Trustee, moved to adopt the minutes. Mr. Mitchell, co-chair, seconded the motion.

   Voted: To accept the minutes of the January 14th, 2016 meeting.

2. **Financial Report**

   Mr. Hemenway, Trustee, reviewed the Trust's financial reports. Discussion followed.

3. **FY 2017 Preliminary Budget Discussion**

   Mr. Hemenway presented the draft FY 2017 Budget and reviewed the salary, city appropriation, datalogger, and well installation line items. Discussion followed. Mr. Simonelli commented on the hourly wages and rent line items. Discussion followed. Mr. Galer inquired about the expense line under the reserves budget. Discussion followed. Mr. Simonelli will finalize the budget and the Board will vote on whether to adopt the budget at the next Board meeting on May 12th.

4. Update on Ground Penetrating Radar (GPR)

Mr. Simonelli updated the Board on the status of a pilot project for determining whether ground penetrating radar, a non-invasive technology, can be used to locate the elevation of the tops of wood piles beneath row houses and other pile-supported buildings in Boston. Mr. Simonelli noted that he met with Jutta Hager, President of Hager Geo-Science at the potential test site. Following the meeting Mr. Simonelli expressed interest in having Ms. Hager update the company's previous proposal and present it to the Board at the March 29th meeting. At the time she agreed. However, in the days after the site visit Ms. Hager communicated to Mr. Simonelli that, after reviewing the proposed strategy with her colleagues, Hager Geo-Science had decided not to revise the proposal, and she was no longer planning to attend the March Board meeting. She noted that the company had already spent a significant amount of time and effort responding to our requests for information and that they could not afford to continue providing pro bono services. Mr. Simonelli informed Ms. Hager that the Trust would not proceed with the project. Discussion followed.

Mr. Galer stated that the Trust should continue to look at potential uses of GPR for this application but not spend too much additional time on finding one. He felt that the technology simply is not where it needs to be. Discussion followed. Ms. Commerford, Trustee, and Ms. Soli, Trustee, stated that they would provide Mr. Simonelli with some potential contacts in the industry. Discussion followed. Mr. Mitchell recalled that a study had been conducted at the potential test site by an MIT graduate student in 2003. Mr. Simonelli noted that the study, which produced mixed results at best, was available online, and that he will post it on the Trust website. Discussion followed. Mr. Simonelli will continue to survey local universities as potential hosts/partners for a research project using GPR and/or other innovative non-invasive technologies. Discussion followed.

5. Review of Bacpoles Study and Bacterial (not Fungal) Pile Decay

Mr. Simonelli reviewed the 2002-2005 Bacpoles study *Preserving Cultural Heritage by Preventing Bacterial Decay of Wood in Foundation Piles and Archaeological sites*,' edited by Dr. René Klaassen which focused on bacterial pile decay. Mr. Simonelli noted the following:

- Study focused on bacterial decay which affects the whole length of the pile and differs from fungal decay which rots just top portion of the pile
- Bacterial decay does occur in older, softer types of wood and is a very slow process, much slower than fungal decay
- Locally very uncommon in Boston but Engineers are testing piles for bacterial decay when they are evaluating or repairing structures

- Fungal decay is still the biggest threat to piles in Boston
- Review of wood preservatives and sea level rise on piles
    - Potential for in-situ treatment is an issue because of access to piles
    - Slightly salt water regime could actually help preserve the piles a bit
    - Piles have a greater risk of decay if pile is submerged for whole life in brackish/salt water
- 2014 Netherlands study looked at an alternative external design that could be 15%-25% lower than traditional underpinning methods

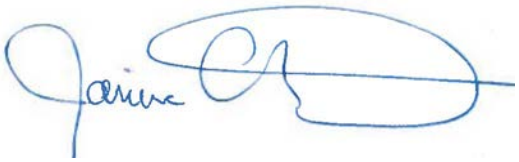
Discussion followed. The Board suggested Mr. Simonelli continue to review the ongoing efforts of the Bacpoles commission and alternative underpinning methods. Refer to the attached *BGwT Board Meeting 3-29-16* PowerPoint for full details of Mr. Simonelli's presentation.

6. Executive Director's Report

BGwT Executive Director Mr. Christian Simonelli distributed his report. Discussion followed. Refer to the attached *Executive Director's Report: March 29th, 2016* for a complete list of activities.

The meeting adjourned at 5:05 p.m.

NEXT MEETING: May 12th, 2016 @ 4:00 pm at the Lenox Hotel.
Notes submitted by Christian Simonelli, BGwT Executive Director, on 3/30/2016.



Approved 31 March 2016

EXECUTIVE DIRECTOR'S REPORT
March 29th, 2016

1. **Readings –** We have almost wrapped up our 3rd set of readings for the year. Due to the record setting snow fall last year we had only one set of readings up to this point.
2. **Meetings –**
    - I met with Michelle Laboy, Seth Wiseman, Joshua Fiedler, and Kristopher Carter to discuss the potential of using Lightwell Technology in BGwT wells to educate the public on groundwater recharge (1/26).
    - I met with newly elected at-large city-councilor Anissa Essaibi-George to review the efforts of the Trust and our role in the GCOD zoning process (2/4).
    - I met with Peter Sherin resident of 122 Beacon Street and Jutta Hager, President of Hager Geo-Science to review the feasibility ground penetrating radar technology for wood pile detection (2/24).
    - I met with Phil Larocque & Luis Melara of Boston Water & Sewer to review the GCOD approval process (2/24).
    - I presented the groundwater issue to the Hammond Residential Real Estate group at 10 Berkeley Street (3/15).
    - I met with Jim White of H.W. Moore & Associates to review to the proposed renovation and groundwater recharge system for 771 Harrison Avenue (3/16).
    - I met with Melissa Schrock of Boston Properties, Mark Haley of Haley & Aldrich, and Brian Fairbanks of Parsons Brinckerhoff to review the proposed development and groundwater recharge system for Back Bay Station (3/17).
    - I attended the City's utility construction kickoff meeting at the Historic Great Hall in Faneuil Hall hosted (3/18).
    - I spoke and met with residents throughout the GCOD to discuss ZBA procedures and advised them on what they need to provide us to satisfy the zoning.
3. **MBTA -** Approximately 47.9 gpm is being injected into recharge wells in the area. In addition to our manual monitoring we have 4 wells in the area with dataloggers recording a water level every 60 min. The recharge system on Cazenove Street overflowed on 1/11/16 and was temporality shut down by BWSC on 1/12/16. The system was recalibrated and restarted by the GZA (the MBTA's Engineer) on 1/28. GZA inspected all recharge systems in the area and adjusted all flow rates. Levels in the Appleton & Tremont Street area are lower than what was projected. The T is investigating why levels are not higher and will update us at the April City-State Groundwater Working Group meeting. On a positive note, the level in the Berkeley Street well by the Benjamin Franklin Institute has slowly risen over the past couple of months and remains high.

4. **Porous Alley 543** - We continue to datalog two wells in Porous Alley No. 543. A summary of the report from CRWA stated the following:
    - Adequate storage has been provided for all storm events
    - Water depth below the porous pavement has not exceeded more than 8''; which is almost a foot below the overflow pipe
    - Other than the need for additional vacuum sweeping the alley is effectively infiltrating stormwater
    - Alley's performance is comparable to other porous asphalt systems in New England
5. **BWSC** - Potential sewer leak in Callahan tunnel however no infiltration discovered. MassDOT to perform inspections and coordinate with BWSC. Low levels by Clarendon and Gray streets in the South End some infiltration seen in laterals. Will look into manholes and report back at April City-State. Alley No. 430 TV inspection completed and are reviewing inspection results. Repairs and recharge installation for alley included in 2016 capital improvement plan. Stanhope Street buildings have issues with back-up in drains along Stanhope Street. They will continue to look at sewers in the area. In addition, they will look at low spots along Fairfield Street and Stuart Street. In repose to the low levels on Commercial Street in the North End they will coordinate with ISD to inspect buildings along Commercial Street.
6. **MassDOT** - Inspected 48'' storm drain trunk line along the prudential tunnel drainage system and discovered groundwater infiltration. Six leaks were sealed on 1/6 and 1/13. Additional inspection of 30'' portion of drain line remains. An update will be provided at the April City-State Groundwater Working Group meeting. So far wells in the area have not shown an increase
7. **Veolia Energy** - The Copley Square Public Library and other smaller steam customers will be investigated as possible locations. Veolia submitted data to DEP on discharge content. The permitting process was vetted and will be completed without any issues.
8. **Eliot Hotel** - The Eliot Hotel on Commonwealth Avenue has had water seeping in through their elevator pits. The problem first sprung up last May and occurred again this past December. BWSC tested the water and the results indicated that it was groundwater. The Hotel is in the process of sealing their elevator pits to avoid additional issues.
9. **Website** - I have added some new content to our website. The most recent items are posted under our "Newest" tab on our homepage. As always, I would appreciate any feedback you may have.

Bacpoles Study

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Bacpoles Study

- Scientific project with the title "Preserving Cultural Heritage by Preventing *bacterial decay* of Wood in Foundation Piles and Archaeological sites," with the acronym BACPOLES
- Purpose was to obtain basic knowledge about the impact of bacterial decay on wood stored under different environmental conditions
- 27 sites in six European countries - Sweden, The Netherlands, Germany, Italy, Norway, & Great Britain
- 13 piling sites, two of which were older than 250 years; five marine sites; and nine archaeological sites

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Bacpoles Study Sites

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What is Bacterial Decay?

- Bacterial decay does not need oxygen and can affect the whole pile
- Decay can occur and actually thrive under submerged conditions with low levels of nitrogen and oxygen
- Many different types of wood degrading bacteria can occur under a wide range of soil conditions
- Wood species also plays a part; Sapwood (more permeable tissue structure) vs Heartwood (less permeable tissue structure)
- Sapwood - when a tree is young, certain cells within the wood are alive and capable of conducting sap or *storing* nutrients
- Heartwood – when the tree no longer needs the entire trunk to conduct sap, and the cells in the central part of the stem beginning at the core, or pith begin to die. This dead wood which forms at the center of the trunk is thus called heartwood
- The sapwood of *pine and oak* are more susceptible to bacterial decay than *spruce* and the heartwood of pine and oak
- From the *thousands* of foundation inspections in the Netherlands, *spruce piles* showed to be less susceptible for bacterial decay compared to pine

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Bacterial Decay Results

- Bacteria degraded wood at all sites, but that the speed of attack is not necessarily the same
- The velocity of bacterial decay is variable between wood species and is generally slow
  - 0.04 in./yr.; 50yrs. = 2-in., 100 years = 4-in.
  - Bacterial invasion before significant wood strength loss occurs is about 0.02 in./yr. in pine, whereas in spruce it ranges between 0.004 to 0.08 in./yr.
- Locally Engineers looking at bacterial decay when underpinning
- Any bacterial decay in submerged portion of the pile? Change the method of underpinning? Alternative foundation? Transfer the load off piles to a concrete mat foundation
- Current understanding of the rates of deterioration, loss of strength, and loss of stiffness of wood with time is still developing

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Fungal Pile Decay

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Fungal Decay

- Fungal decay needs oxygen and only affects the part of the pile that is exposed to air
- Remaining (submerged portion of the pile) is unaffected
- Piles here are of spruce wood species
- Even if bacterial decay is present rate of decay is much slower
- If the pile heads are above the ground water level, the high oxygen supply through air will allow wood degrading fungi to be active
- The velocity of the decay is determined by:
  - The duration of the time that pile heads are above the ground water
  - Length of the pile head which is above the ground water table
  - The water-bearing capacity of the soil
  - The wood species used
- Fungi that attack wood under optimal/extreme conditions can cause a rate of rot around 4 in./year
- Some cases where piles have been exposed to air it can be anywhere from 3-10 years depending factors mentioned above

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Conclusion

- Although bacterial decay will occur at some point, fungal decay is still the biggest threat to pile decay in Boston
- Piles here not as old as those in European countries
  - Piles here around 150 years old
  - Piles in Europe 300-600 years old
- Going forward studying alternative foundation method(s) is the way to go
- 2014 Netherlands study looked at an alternative external design that could be 15%-25% lower than traditional underpinning methods

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Additional Research....

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In-Situ Treatment,/Injection of Preservatives?

- Piles installed today are treated with preservatives
- Access is the real issue and like underpinning this would consume much of the cost
- In addition we have the unknown of exactly how many layers of pile caps there are
- Ethylene glycol and sodium borate solutions would mostly likely be used for their fungicidal properties
  - How does solution spread through the granular fill?
  - How does it know where the wood piles are?
  - Does it soak into the wood or just the perimeter of the pile?
  - Toxicity an issue?
  - How long would it last?
  - Confirmation that the piles have in fact been treated?

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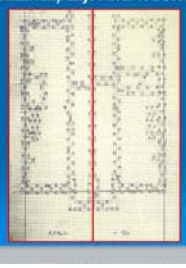
In-Situ Treatment,/Injection of Preservatives?

Pile Layout



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Sea Level Rise and Affect on Piles

- Current water surrounding piles is fresh water
- Rising sea levels could result in water becoming "Brackish"
  - Brackish water – Fresh and salt water mixing together
- Based on research and discussion with Engineers brackish water would most likely not increase the risk of decay
  - Primary issue is oxygen availability (fungal decay) thus depressed groundwater levels
  - Slightly salt water regime could actually help preserve the piles a bit
  - Piles have a greater risk of decay if pile is submerged for whole life in brackish/salt water

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