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Via Email delivery

Memorandum

To: Lindsey Breylinger
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From: John Rockwell Hosbach

Date: February 10, 2026

Property: Hanover / New Britain project

Project: Riparian Buffer

1. Executive Summary

The proposed site development within New Britain Township, Bucks County, Pennsylvania (Hanover / New Britain project) will require the removal of 85 specimen trees meeting the Township's regulated size threshold. New Britain Township's specimen tree protections are intended to preserve viable, long-term canopy and associated ecological services (stormwater interception, evapotranspiration, shading and heat-island mitigation, carbon storage, habitat value, and overall community character). However, the specimen tree inventory indicates that the majority of regulated diameter on this site is represented by trees in poor or dead condition, which substantially reduces the likelihood that these trees will provide persistent canopy function over the planning horizon.

In lieu of the tree-for-tree or inch-for-inch replacement, which can be numerically compliant yet ecologically non-equivalent where removed trees are predominantly non-viable, this report proposes a function-based mitigation alternative for Township consideration and approval: restoration, enhancement, and long-term management of the site's riparian buffer, including invasive species control, stand structure improvement, restocking with protected native trees, and multi-year monitoring and maintenance.

Field sampling using five (5) 1/10-acre plots along the riparian corridor confirmed that the existing buffer is not consistently stocked to function as a true 100-foot vegetated buffer along its full extent.



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A quantified deficiency of $206,950 \pm$ square feet of canopy/vegetation coverage was documented, equivalent to approximately 4.7–4.8 acres of understocked buffer. Based on observed stocking (average 12 trees per 1/10 acre, equivalent to ~120 trees per acre), restoring deficient segments to a functional stocking level requires approximately 570 native forestry-grade whips (4'–5' height) installed with metal deer cages, integrated with invasive control and adaptive management.

This mitigation framework is presented for review under New Britain Township (Bucks County, PA) specimen tree requirements and is intended to satisfy the Township's ordinance objectives through a measurable, enforceable, and ecologically superior alternative to diameter-only equivalency where regulated trees are predominantly poor or dead.

2. Purpose and Scope

This report provides New Britain Township with:

- ☐ A quantitative summary of regulated specimen trees proposed for removal, including condition-based interpretation of canopy value and persistence.
- ☐ A scientific and ordinance-intent rationale for implementing riparian buffer restoration as mitigation in lieu of strict tree-for-tree or DBH-inch equivalency.
- ☐ Field methods and findings from five (5) 1/10-acre sample plots used to estimate stand stocking and identify invasive constraints within the riparian corridor.
- ☐ A comprehensive mitigation and long-term management framework including invasive control, selective thinning/shelterwood (where appropriate), restocking/reforestation, and multi-year monitoring with enforceable performance standards and reporting deliverables.



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3. New Britain Township Specimen Tree Ordinance Context and Applicability

NEW BRITAIN TOWNSHIP, BUCKS COUNTY, PENNSYLVANIA

This report has been prepared for review by New Britain Township, Bucks County, Pennsylvania, and specifically addresses the Township's regulated Specimen Tree requirements applicable to land development and subdivision activity. The intent of New Britain Township's specimen tree provisions is to ensure that regulated, mature trees, recognized as high-value community resources, are preserved to the maximum extent practicable, and where removal is unavoidable, that impacts are mitigated in a manner that protects the Township's long-term canopy, environmental quality, and sensitive natural resources.

For purposes of this report, the term "Specimen Tree" refers to trees meeting the Township's regulated size threshold and definition under the New Britain Township Subdivision and Land Development Ordinance (SALDO) and/or related Township code provisions, including any applicable standards governing protection, justification for removal, and mitigation expectations. This report is structured to provide the Township with a technically defensible basis to evaluate: (1) the condition and functional value of regulated specimen trees proposed for removal; (2) the ecological tradeoffs of mitigation options; and (3) the suitability of a function-based riparian buffer mitigation strategy as an ordinance-intent compliant alternative to strict tree-for-tree or inch-for-inch replacement.

4. Regulatory Context and Basis for Function-Based Mitigation Under Township Review

New Britain Township's specimen tree protections are intended to preserve viable, long-term canopy and the ecological services provided by large, established trees, including stormwater interception, evapotranspiration, shading and heat-island mitigation, carbon storage, wildlife habitat, and overall community character. The Township's review framework appropriately prioritizes avoidance and minimization of specimen tree impacts; however, where removal is necessary due to unavoidable site constraints, mitigation should be evaluated based on whether it achieves the ordinance's functional objectives and produces durable environmental outcomes.



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Where the specimen tree population proposed for removal is dominated by trees in poor or dead condition, strict diameter-based replacement (tree-for-tree or DBH-inch equivalency) may not represent true functional equivalency. Specifically:

Dead specimen trees provide negligible canopy function and do not contribute to long-term canopy persistence.

Poor-condition specimen trees are more likely to experience decline and mortality, thereby reducing the certainty that DBH inches translate to sustained canopy services.

Accordingly, this report proposes that New Britain Township consider approval of a functional mitigation alternative focused on restoration and management of the site's riparian buffer, a sensitive resource area where investments in vegetation structure, invasive control, reforestation, and long-term maintenance yield a high and measurable return in ecological function, resilience, and canopy performance.

5. Specimen Tree Inventory Summary

5.1 Regulated Tree Count

Total specimen trees identified: 148 (only 85 being removed)

5.2 Condition and Cumulative Diameter

Fair Condition: 1,483 DBH inches

Poor Condition: 4,240 DBH inches

Dead Condition: 1,006 DBH inches

Total Cumulative Specimen Diameter: 6,729 DBH inches



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5.3 Condition-Weighted Interpretation (Functional Canopy Perspective)

DBH-inch totals provide a standardized measure of size; however, condition is a dominant predictor of canopy persistence and the likelihood that regulated diameter will translate to durable ecological services.

Dead trees provide no canopy function (interception, evapotranspiration, shading) and no long-term canopy contribution.

Poor-condition trees typically exhibit reduced vigor, crown retrenchment, higher mortality probability, and lower resilience to additional stressors.

Fair-condition trees are the most likely to provide stable medium-term canopy services.

Condition distribution significance:

Poor + Dead combined = 5,246 DBH inches, representing ~78% of total regulated diameter (5,246 / 6,729). This indicates that strict DBH equivalency can be an unreliable proxy for ecological equivalency where the majority of removed diameter is unlikely to persist as functional canopy.

Technical conclusion: A mitigation plan that restores deficient riparian buffer function and installs protected, survivable native trees, while controlling invasives and improving stand structure, better aligns with the ecological intent of specimen tree protections than diameter-only replacement.

6. Consistency with New Britain Township Resource Protection Priorities **Riparian Corridor as the Highest-Value Mitigation Receptor**

The riparian corridor on the subject property represents a high-value environmental receptor consistent with the Township's broader land development objectives, including protection of water resources, reduction of stormwater impacts, and maintenance of ecological corridors. The proposed mitigation program is designed to:

- ☐ Address a quantified deficiency in continuity and stocking of the riparian buffer
- ☐ Improve long-term canopy recruitment and species diversity



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- ☐ Reduce invasive species dominance that suppresses native regeneration
- ☐ Implement enforceable performance metrics that allow the Township to verify compliance over time

Rather than relying on an accounting method that primarily tracks trunk diameter totals, the riparian approach advances Township goals by prioritizing ecological function, including pollutant interception, streambank stability, flood resilience, and sustainable canopy establishment in an area of heightened environmental sensitivity.

7. Why Riparian Buffers are Critical

Riparian buffers are among the highest-value ecological systems in developed landscapes because they mediate interactions between uplands and aquatic systems.

7.1 Water Quality Protection and Pollutant Interception

A functional riparian buffer reduces offsite impacts by:

- ☐ Sediment capture and reduced turbidity
- ☐ Nutrient interception via plant uptake and microbial processes
- ☐ Contaminant filtration where pollutants are sediment-bound

7.2 Flood Attenuation and Hydrologic Stability

Vegetated buffers increase infiltration and roughness, thereby reducing:

- ☐ Runoff velocity
- ☐ Peak discharge effects near the channel
- ☐ Flashy hydrologic response adjacent to streams



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7.3 Streambank Stabilization and Erosion Resistance

Root systems improve bank stability by:

- ☐ Increasing soil reinforcement and shear strength
- ☐ Reducing undercutting and bank failure
- ☐ Limiting sediment delivery during storm events

7.4 Thermal Regulation and Aquatic Habitat Support

Riparian canopy reduces thermal loading through shading and improves habitat stability, while contributing organic inputs that support aquatic food webs.

7.5 Habitat Connectivity and Biodiversity

Continuous riparian corridors function as:

- ☐ Movement pathways for wildlife
- ☐ Diverse edge habitats with layered vegetation structure

Township-facing conclusion: Restoring a deficient riparian buffer provides measurable, high-value ecological function and is therefore an appropriate mitigation tradeoff, particularly where specimen trees removed are predominantly poor or dead.

8. Field Methods: Riparian Buffer Stocking Assessment

8.1 Buffer Target and Delineation

Goal: establish or maintain a consistent 100-foot riparian buffer along the corridor.

Deficient segments were denoted by Mr. Jeff Bean (Bohler Engineering) to maintain consistency with land development exhibits.



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8.2 Sampling Design

Five (5) 1/10-acre sampling plots were collected within the buffer to quantify:

- ☐ Stand stocking
- ☐ Species composition and condition distribution
- ☐ Invasive presence and regeneration constraints

8.3 Stocking Calculation

Trees counted within each plot were expanded to a per-acre estimate:

Trees per acre = (Trees per 1/10 acre) × 10

9. Findings: Stocking, Deficiency, and Restocking Requirements

9.1 Representative Plot Summary

Average DBH and species representation observed (multiple trees/species within the five plots):

4 Black Walnut @ 12" DBH (Fair)

7 Black Cherry @ 10" DBH (Poor)

1 Boxelder @ 16" DBH (Poor)

Total: 12 trees per 1/10 acre

This equates to:

~120 trees per acre along the riparian buffer.



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9.2 Quantified Buffer Deficiency

A deficiency of $206,950 \pm$ SF of vegetation/canopy was confirmed along the corridor to support a consistent 100' buffer.

$$206,950 \text{ SF} \div 43,560 \text{ SF/acre} = \sim 4.75 \text{ acres } (\approx 4.7\text{--}4.8 \text{ acres})$$

9.3 Restocking Need

Using observed stocking as a baseline target (~ 120 trees/acre):

$$4.75 \text{ acres} \times 120 \text{ trees/acre} = 570 \text{ trees (rounded)}$$

Restocking requirement: install approximately 570 native forestry-grade whips (4'–5') in metal deer cages.

10. Invasive Species and Limiting Factors

10.1 Invasives in Sample Plots

- ☐ Multiflora rose
- ☐ Grape vine
- ☐ Honeysuckle vine
- ☐ Privet

10.2 Other Invasives / Constraints in Adjacent Buffer Areas

Amur honeysuckle

Poison ivy (operational hazard affecting access and management planning)

10.3 Ecological Implications

Invasive shrubs and vines suppress regeneration through competition, overtopping, thicket formation, and persistent resprouting/seedbank dynamics.



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Technical requirement: restoration success depends on a combined program of: invasive control + planting/restocking + browse protection + monitoring + follow-up treatments.

11. Proposed Riparian Mitigation and Long-Term Management Plan

11.1 Invasive Species Removal and Long-Term Invasive Control

Objective: reduce invasive dominance and prevent rebound.

Initial treatment/removal focused on woody invasives and vine complexes.

Follow-up controls scheduled to address resprouts and new recruitment.

11.2 Shelterwood or Selective Thinning to Improve Stand Structure (Where Applicable)

Objective: improve vigor and structure without destabilizing the corridor.

Selective thinning may be used to release desirable stems and reduce poor-condition competition where it limits restoration objectives.

Maintain canopy continuity where feasible to preserve microclimate and reduce invasive reinvasion.

11.3 Planting of Native Forestry Whips and Understory Species

Objective: restock deficient segments and establish future canopy.

Quantity: ~570 trees

Stock: forestry-grade native whips, 4'–5'

Protection: metal deer cages

Installation areas: ~4.7–4.8 acres of deficient buffer



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11.4 Increased Species Diversity to Enhance Resilience

Objective: improve stand resilience and reduce single-agent risk.

Species diversity improves long-term durability and reduces vulnerability to pest/pathogen-driven mortality events.

11.5 Restoration and Management of Riparian Buffer Areas

Objective: establish a continuous, functioning buffer consistent with 100-foot corridor intent.

Restoration prioritizes deficient segments to improve continuity and ecological function.

11.6 (5 -Year) Management, Monitoring, and Maintenance

Objective: ensure establishment and long-term performance.

- ☐ Annual survival checks and replacement planting as needed
- ☐ Cage maintenance and adjustment
- ☐ Invasive re-treatment cycles
- ☐ Photo-point monitoring
- ☐ Annual reporting to Township

12. Township Approval and Enforceability Statement

The proposed mitigation program is structured to support New Britain Township's enforcement and verification needs. The plan includes quantified restoration acreage, a defensible restocking calculation, mapped treatment and planting zones, and multi-year monitoring with survivability and invasive control performance standards. These elements allow the Township to condition approval on clear deliverables and objective outcomes, ensuring mitigation is not merely installed but successfully established and maintained.



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13. Enforceable Performance Standards

13.1 Installation Requirement

Install approximately 570 protected native trees within mapped deficient riparian buffer segments (~4.7–4.8 acres).

13.2 Survival and Stocking Performance

≥85% survival at end of Year 1

≥80% survival at end of Year 3

Replace mortalities during the next planting window to maintain required thresholds.

13.3 Invasive Control Performance

Annual invasive management documentation (maps/logs) demonstrating continued suppression and retreatment where required.

13.4 Buffer Continuity Verification

Provide as-built restoration mapping demonstrating deficient segments have been restored to support a continuous 100-foot vegetated corridor intent.

13.5 Reporting Deliverables – (5 years)

Annual deliverables to Township shall include:

- ☐ Tree survival tabulation and replacement log
- ☐ Invasive treatment log
- ☐ Photo-point documentation appendix
- ☐ Updated restoration maps and acreage summary
- ☐ Brief narrative progress report and adaptive recommendations



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14. Conclusion

New Britain Township's specimen tree protections are intended to preserve functional, viable, long-term canopy. The specimen tree inventory indicates that regulated diameter is dominated by compromised trees: poor and dead condition classes represent ~78% of the total regulated diameter (5,246 of 6,729 DBH inches). Under these conditions, strict DBH-based replacement can be numerically compliant but does not reliably produce functional equivalency or long-term canopy persistence.

The riparian corridor represents a sensitive ecological receptor where restoration provides direct, measurable benefits consistent with Township resource protection priorities: improved water quality interception, streambank stability, flood resilience, habitat connectivity, and durable canopy establishment. Field sampling confirms a quantified deficiency of $206,950 \pm \text{SF}$ (~4.7–4.8 acres) in buffer vegetation/canopy. Restocking these deficient segments at observed stocking levels requires ~570 protected native trees, integrated with invasive control, selective stand improvement where appropriate, and multi-year monitoring with enforceable standards.

Accordingly, this report recommends Township approval of a function-based mitigation strategy, focused on riparian buffer restoration and long-term management, in lieu of strict tree-for-tree replacement. This approach better fulfills the intent of the ordinance by prioritizing the site's most valuable ecological resource, and it establishes clear, enforceable performance standards that allow for objective compliance verification and long-term success.



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