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September 10, 2019

Mr. Gary Zahornasky
Chairman
Inland Wetlands Commission
54 Hill Street
Shelton, CT 06484

Re: Towne Center at Shelter Ridge – Proposed Development Reference #17-14

LandTech has conducted a review of documents submitted in support of and in opposition to an application for the development of a 121-acre parcel along Bridgeport Avenue (S.R. 714) to support commercial and residential buildings with paved parking. The remainder of this letter presents our comments and recommendations concerning the application documents.

Reviewed documents include:

- Set of plans (4 sheets) entitled "Existing Conditions," prepared by Lewis Associates and dated 3/6/16.
- Set of plans (18 sheets plus cover sheet) entitled "Towne Center at Shelter Ridge," prepared by James R. Swift, PE, dated 12/22/17, and revised through 4/18/18.
- Engineering Report prepared by James R. Swift, PE, dated 12/22/17, and "Watershed E" subsection revised through 4/18/18.
- Exhibit C, Letter dated 2/16/18 from R. Kulacz, PE, to J. Cook.
- Exhibit H, Letter dated 2/10/18 from S. Trinkaus, PE, to G. Zahornasky.
- Exhibit 2D: Wetland Delineation Report prepared by Pietras Environmental Group, LLC, dated June 22, 2015.
- Exhibit 3, watershed map no date.
- Exhibit 7 Environmental Assessment by Matthew J. Popp of Environmental Land Solutions, dated 1/19/18
- Exhibit 21, Letter with attachments dated 3/15/18 from T. Harbinson.
- Exhibit 31, Memo dated 3/23/18 from R. Kulacz, PE, to file.
- Exhibit 33: Letter dated 3/29/18 from M. Popp to G. Zahornasky.
- Exhibit 36: Letter dated 3/28/18 from J. Swift, PE, to G. Zahornasky.
- Exhibit 39: Letter dated 4/8/18 from T. Harbinson to G. Zahornasky
- Exhibit 42: Letter dated 5/14/18 from S. Trinkaus, PE, to G. Zahornasky.
- Exhibit 45, Letter dated 6/5/18 from R. Kulacz, PE, to J. Cook.
- Exhibit 48: Letter dated 6/28/18 from J. Swift, PE, to G. Zahornasky.

- 2017 Update To The 2006 Plan Of Conservation and Development, prepared by the Shelton Planning and Zoning Commission, January 2017.
- City of Shelton 2009 Open Space Plan, prepared by the Shelton Conservation Commission, January 20, 2009.

Natural Resources Review

INTRODUCTION

The 121.24 ± acre property contains: 1) a wetland corridor which includes a large high quality vernal pool, 2) smaller isolated wetlands, 3) a mature hardwood forest, and 4) upland and wetland meadow/scrub shrub communities which are maintained along the power line and natural gas rights of way that bisects the property. The eastern portion of the property lies within the City's economic corridor while the western portion lies within a greenway corridor. The property is surrounded by high density housing to the north, City owned open space to the west, low to medium density residential properties to the southwest, a sensitive brook and scenic road to the south and a busy state highway to the east.

The various surrounding land uses, the size of the property and its existing sensitive natural resources, and the complexity of the proposed development require careful and detailed assessments of each of the site's sensitive natural resources to ensure that the Inland Wetland's Commission has all the information it needs to properly manage the resources within its purview.

INLAND WETLANDS, VERNAL POOL AND WILDLIFE

We conducted a site visit on Aug 27, 2019. During that visit we inspected the existing conditions of the site's wetlands, vernal pools and uplands.

The area designated as vernal pool by the applicant was found to be a very high quality system. Evidence for this includes adequate shade, varying topography within the basin, appropriately sloped banks, an abundance of woody attachment sites and suitable adjacent upland habitat.

The description of the vernal pool in the Environmental Assessment prepared by Environmental Land Solutions (referred to as ELS) is inadequate for a project of this size and complexity. The vernal pool on the property is shown on the site plans but the description of existing conditions and potential impacts from the proposed activities is only minimally discussed.

Specifically, the ELS report mentions that obligate vernal pool species were observed in the vernal pools however, no discussion of whether evidence of successful breeding was observed (egg masses or hatched larvae) was provided. No data on the size of the breeding effort such as number of egg masses per species was provided. The number of egg masses is a good indicator of the size of the adult population of obligate species utilizing the pool. This information is essential to understanding not only the current functions of the vernal pool but also the potential or likely impacts from the proposed development. A more detailed description of the physical, hydrological and biological components of the vernal pool should be provided.

Vernal pools are not isolated systems and vernal pool species are not limited to the wetlands. The amphibian species that rely on these pools for breeding a couple weeks out of the year rely on the adjacent upland for the vast remainder of the year. Suitable upland amphibian habitat exists adjacent to the vernal pool and the basin contains slopes which are easily navigable to amphibians however, the applicant has not provided any data on the expected migration routes to and from the pools. Therefore, one cannot assess if the two 16,000 sf footprint buildings and the associated parking lot to the east and

the residential apartments to the southeast of the vernal pool will impact the non-breeding habitat of the vernal pool species. Only when this information is provided can an impact assessment be made.

No rating of the vernal pool has been provided. The pool should be evaluated using a generally accepted method such as the "Best Management Practices Conserving Pool-Breeding Amphibians in Residential and Commercial Developments in the Northeastern United States prepared by Calhoun and Klemens, 2002. The metrics in that evaluation result in a Tiered rating of ecological significance.

Vernal pool breeding success (egg deposition and complete amphibian metamorphosis) can vary drastically from year to year. Variability is based on population dynamics as well as rainfall. The ELS report states that site visits were conducted March, April and August of 2015, February 2016 and June 2017 of which the wetlands were evaluated for vernal pool functions during the spring of 2015.

According to the National Oceanic and Atmospheric Administration's (NOAA) National Integrated Drought Information System, the 2015 breeding season was the start of a multi-year drought. Sampling during that time may not have provided results of a typical rainfall year. Less rainfall often reduces the hydroperiod in a pool reducing its ability to provide adequate water to support full amphibian metamorphosis in some pools. In most cases data from one breeding season is all that is available for a particular application process. However, this application process has been proceeding for multiple years allowing data from multiple breeding seasons to be collected. In this case, collecting breeding data during the spring of 2018 and 2019, which were more normal rainfall years, was possible. Due to the density and proximity of the proposed development it is appropriate to obtain and review data from multiple years in order to better understand the breeding success during "most years" which is the objective.

We inspected Wetland F and generally agree that the basin may dry up too quickly to achieve full metamorphosis of obligate species in some or most years. The ELS report states that data were collected in 2015 and that the basin did not have the habitat to support successful breeding. As stated above, 2015 was the start of a 3 year drought period. Without data collected during "normal rainfall years" there is no information in the application that shows if the basin can support metamorphosis during "most years" which again is the bench mark for proper evaluation. It is possible that Wetland F cannot support the development of vernal pool species even during years with more normal rainfall. However, the data were not provided. This is important for a wetland that will be completely filled during the development. These data should be provided to the Commission for their use.

Calhoun and Klemens (2002) recommend, based on scientific data, that no disturbance should occur within 100 feet of a vernal pool and no more than 25% of the area should be disturbed within 100 - 750 feet of the vernal pool. The applicant should provide coverage disks showing expected post development coverages of the vernal pool.

The impact of the lighting from the proposed parking lot 160'± to the east of the vernal pool is not mentioned. The ELS report recommends that all lighting other than sign lighting should be dark sky compliant (facing downward). We agree. LandTech saw no lighting analysis in the materials provided. This information should be provided to understand the intensity of light that will penetrate into the vernal pool as lighting has been shown to affect metabolism and breeding success in amphibians (during the breeding and developmental periods of the season).

The ELS report recommends a planting plan however, a planting plan was not provided to our office and therefore was not reviewed. If one has been prepared, it should be provided to the commission for review.

No information was provided on how the area between the buildings, parking lots and roads and the open space will be maintained (lawn, shrubs, etc.) The Commission should be concerned about this as

portions of these areas drain to the vernal pool making the introduction of fertilizer to this area a concern. Strategic plantings in these areas would also further mitigate any lighting on the vernal pool from the development. The proposed plantings or land use of this area should be provided.

Unless the wildlife usage patterns, lighting, impacts from fertilizers and other potential impacts from the surrounding landscape is fully understood, the development of both the residential apartments southeast of the vernal pool and the twin two story 16,000 sf footprint medical/professional buildings and associated parking lot proposed east of the vernal pool cannot be justified.

Photographs of the smaller wetlands and or representative areas of the larger wetlands are useful to the reader in understanding the text and should be included

The USACE Highway Methodology Workbook Supplement, Wetland Functions and Values, A Descriptive Approach, prepared by the US Army Corps of Engineers and used by ELS defines the function of Wildlife Habitat as being limited to populations of animals typically associated with wetlands or wetland edge. However, the assessment for eastern and western wetland pockets (Wetlands B & F) lists Wildlife Habitat as a function even though those wetlands are dry most of the year and ELS reports that they are not functioning as vernal pools. This inconsistency should be addressed.

The Drainage section on pages 7 and 8 of the ELS report cites excerpts from the Engineering Report on what the drainage system must do however the Environmental Assessment does not provide a professional opinion if the drainage system meets those requirements, if the drainage system is appropriate for the site, or causes any unnecessary impacts to the site's sensitive resources. This information should be provided.

We make a similar comment to the Erosion Controls section. No professional opinion was provided if the proposed erosion controls were appropriate for the proposed development.

The ELS report does not mention the diversion of water to different watersheds and if those diversions have a negative impact on the water budgets of onsite wetlands. This should be included.

A wetland mitigation basin is proposed by enhancing the southernmost portion of wetland A and converting the upland between the two wetland lobes to wetland. However, the Environmental Assessment makes no mention of how this wetland will be created or how it will be planted; nor does such information appear on the application drawings. Detailed explanation of this work and the negative or positive impact on the landscape needs to be provided.

In ELS's response to Trinkaus Engineering LLC letter, they state no soil testing, no construction sequence and no planting plan were provided for the mitigation wetland. The response continues that the wetland will be created at the same elevation as the adjacent wetlands. LandTech shares the same concerns of Trinkaus Engineering. A detailed construction and planting plan should be provided so the commission can have some confidence that a self-sustaining wetland system can be created.

It is unclear how a wetland constructed between two existing wetlands can be done without physically disturbing the adjacent wetlands. These wetland impacts were not listed in the Direct Wetland Impacts section of the ELS report. This information should be provided.

Both lobes of Wetland A that are on the property are dominated by the invasive Common reed (*Phragmites australis*). We did not see this mentioned in the ELS report. If this application is approved and the 4,540sf of wetland is created, we recommend controlling all invasive species and replacing them with native meadow and shrub species Wetland creation and disturbance are of interest to the Inland Wetlands Commission and should be included in the application.

There is no impact assessment of how the discharge of stormwater from Parcel C to Wetland G via the proposed swale will or will not impact Wetland G. Impacts could include scour, increased turbidity or

increased temperature. These should be discussed. We have similar concerns to Trinkaus Engineering regarding potentially changing the existing hydroperiod in Wetland G. An assessment of if the change would significantly impact the current functions of the wetland is needed.

The Western Pocket Wetland (Wetland B) is totally surrounded by stone wall, and development. ELS recommended moving the stone wall to the eastern side of the wetland and as close as possible to the development, we agree with this recommendation.

Stormwater Management

INTRODUCTION

The stormwater management plan for this project must include three major components: 1) erosion and sediment control during construction, 2) stormwater treatment to prevent the discharge of unreasonable amounts of sediment and nutrients and other contaminants to the wetlands and watercourses, and 3) flow attenuation to ensure that the project does not increase the risk of downstream flooding or accelerated erosion.

The project includes several underground stormwater infiltration areas. Stormwater collected from the project impervious areas first passes through hydrodynamic separators (oil and grit separators) before entering the infiltration areas. The infiltration areas are intended to hold a portion of the runoff volume temporarily, then release it at a controlled rate to avoid an increase in flow rate, which is discussed below. The infiltration areas are also intended to hold a portion of the runoff from each storm until the runoff can infiltrate into the ground.

This project proposes to disturb about 72 acres and must therefore be registered with the DEEP and comply with the requirements of the *"General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities."* The applicant must prepare a stormwater pollution control plan and submit a registration form to the DEEP. This registration must include a certification by a qualified professional who designed the project and a second certification by an independent qualified professional who reviewed the stormwater pollution control plan. Both certifications must verify that the stormwater pollution control plan complies with the requirements of the general permit.

EROSION CONTROL DURING CONSTRUCTION

The major threat to the watershed during construction is the discharge of sediment-laden stormwater runoff. This project proposes the use of sediment barriers (silt fence and hay bales) and temporary sediment basins with diversion channels. A robust erosion control plan is required to protect wetlands and watercourses. The proposed erosion control plan is inadequate, and we recommend the following revisions:

1. Divide the project into phases. The phasing plan for the project should be such that the entire site is not disturbed at once. The phasing plan should state the order in which the phases are to proceed, along with language describing conditions under which each successive phase may begin (previous phase stabilized, etc.). At no time should more than ten acres be disturbed at once.
2. Add a procedure for managing stormwater during the time between when a temporary sediment basin is removed and the corresponding infiltration area is complete and ready to accept stormwater.
3. The narrative for each parcel or phase should require diversion channels to be built concurrently with the associated temporary sediment basins.
4. Add notes and schedule stating maintenance requirements.

5. Whether or not the temporary sediment basins depicted on the drawings will work is impossible to determine. In addition, the drawings do not provide enough information to allow a contractor to construct them. We recommend that the applicant:
    a. Provide a typical section for a temporary sediment basin and include dimensions for each individual basin.
    b. Provide a construction detail for a typical outlet structure and for each basin's emergency overflow. Include dimensions for each individual basin, and show the location of each emergency overflow on the plans.
6. Show a typical section with dimensions for each diversion channel.
7. The proposed sediment basin outlets should discharge as sheet flow onto undisturbed areas, not to newly constructed storm drains as proposed. It is reasonable to expect the presence of detrimental levels of suspended sediments in the sediment basin discharges, resulting in the discharge of turbid water to downstream resources. We recommend that the erosion and sediment control plan include measures to reduce turbidity using flocculants or other design measures before leaving the site or entering a wetland or watercourse.
8. Show the requirement to install and maintain catch basin filters in all existing catch basins within the project area along Bridgeport Avenue plus all new catch basins as they are installed.
9. The plans require installation of an erosion control blanket (ECB) on steep slopes higher than 6'. We recommend that this requirement be revised to require ECB on all slopes steeper than 3:1, regardless of height. We also recommend that all ECB be 100% biodegradable. ECB with nylon or polyethylene reinforcement net remain in the environment for long periods of time and represent a hazard to birds and small wildlife.
10. All slopes steeper than 3:1 and higher than 15' should be benched.
11. The erosion control plan should include provisions for dust control and for the management of dewatering discharges.
12. In several locations, the plans show the installation of silt fence at the toe of slopes. The silt fences should be moved away from the toe of slope enough to provide an access path for maintenance.
13. We recommend that the anti-tracking pads used at construction entrances be widened to at least 20' to accommodate the maneuvering of large trucks exiting the site.
14. We recommend that the following requirements be added to the erosion control narrative.
    a. Silt fence not installed parallel to the slope are to have five-foot-long wings installed every 100 feet to intercept and diffuse flows along the silt fence.
    b. Additional control measures are to be installed during the construction period if required. A minimum of 300 feet of silt fence or other sediment barrier are to be stored at the site for emergency use.
    c. Silt fences are to have sediment removed when the depth of the sediment is equal to 1/3 the height of the fence. Fences are to be properly installed, and ripped fence or broken posts repaired as soon as practical.
    d. Catch basin inserts (silt sack or equivalent) are to be cleaned or replaced when the reservoir is full.
    e. Anti-tracking pads at construction entrances are to be replaced when void spaces are full.

f. All temporary erosion and sedimentation control measures are to be properly maintained until stabilization has been achieved. Temporary erosion control measures are to be removed and the soil surface stabilized when construction is complete and the soil surfaces are permanently stabilized. Structural components are to be cleaned of all sediment upon completion of construction. Stabilization means that: 1) temporary or permanent vegetation has been established, 2) disturbed soil surfaces within 100 feet of the wetland have a dense stand of grass or are covered by an erosion control blanket (ECB), or 3) turf or landscape areas are planted or mulched. If seasonal restrictions exist for planting, the City of Shelton staff shall determine whether the site is stabilized in accordance with the above criteria, prudent construction practices, and the *Connecticut Guidelines for Erosion and Sediment Control.*

g. In the event of conflict between this plan and other requirements or regulations, the more stringent shall apply.

h. All erosion and sedimentation controls shall be inspected weekly and within 24 hours after a storm event depositing more an inch or more rain event within 24 hours. Inspections shall be conducted a qualified person approved by the City of Shelton. The City should have the name and 24 phone number of the person responsible for inspecting the erosion and sedimentation controls.

i. Provide the name and 24-hour telephone number of the person who is assigned the responsibility for implementing the erosion control plan to Shelton staff.

STORMWATER TREATMENT

Stormwater runoff from the site will drain to Wells Hollow Brook and Far Mill River through existing drainage pipes in Bridgeport Avenue and a new pipe crossing Mill Street. The project should be designed, constructed and operated in a way that protects Wells Hollow Brook, Far Mill River and on-site wetlands and watercourses from increases in the amounts of sediment, nutrients and other contaminants from the project. There is no opportunity for stormwater treatment once runoff enters these drains.

The project proposes to treat runoff from impervious areas (pavement and roof), and not from all landscaped areas and undisturbed areas. Also, the project does not propose to treat the widened pavement along Bridgeport Avenue. For example, there are 14.85 acres within watershed E where runoff is not directed to a separator and infiltration area. Most of this area is designated not to be disturbed, but about 600 feet of new road extending from Bridgeport Avenue into the project along the south end of Parcel B is not treated. In watershed B, calculations for WQV are presented for subwatersheds B3a and B3c, but not for B1, B2 or B3c. Stormwater from all areas to be disturbed within the project should be treated (directed to the infiltration areas). Landscaped areas can be expected to be fertilized. Runoff from fertilized areas contains nutrients that may contribute to the eutrophication of downstream water bodies.

According to the calculations in the drainage report, the total area of all the watersheds for the project is 204.63 acres, but the total for proposed conditions is 197.26 acres. There is no change to the outer boundary of all the watersheds, so the totals should be the same.

Information related to the time of concentration is provided for the revised watershed E analysis, but not for the other watersheds. Therefore, we are unable to confirm the related calculations.

There are no calculations showing that the proposed swales have the capacity to convey the proposed flows and the depths and velocities of those flows.

The hydrodynamic separators are intended to remove sand and floating contaminants (oil, etc.). Manufacturer's information related to the separators shows that an assumed particle-size distribution ranging from 20 microns to 2000 microns was used in analyses to estimate the ability of the separators to remove sediment from runoff before it enters the infiltration areas. There is no information comparing the assumed particle sizes to the particle sizes that can be expected to be in runoff from parking areas, turf grass and roofs.

There is no information related to the percentage of large particles (say 2000 microns) versus the percentage of fines (say 20 microns) removed. Typically, a separator will remove a high percentage of large particles (sand) and a low percentage of fines.

The plans do not include information related to the size, model number or removal efficiency of all separators (some are "custom"). There is no way to determine whether they are appropriately sized or not and to determine their removal efficiencies.

The separators remove solids and other contaminants from the flow entering the infiltration area to extend the period between maintenance and to reduce the amount of contamination exiting the infiltration areas. The drainage system includes a bypass manhole immediately before each separator. The flow associated with the WQV (known as the water quality flow, WQF) is directed through the separator before entering the infiltration area, and the rest is conveyed around the separator directly to the infiltration area.

The WQF calculation for area F1 shows the WQF (related to 1" rainfall) to be greater than the 10-year peak flow (5.0" rainfall). There appears to be a discrepancy somewhere in the calculations.

There is a major flaw in the stormwater analysis. The capture of the WQV for water quality purposes depends on the availability of 6-9" of dead storage in the bottom of each infiltration area. There are no soil tests in these areas to demonstrate that water can infiltrate into the ground fast enough so that the WQV storage area will be empty when needed. A typical requirement is that the underlying soil have hydraulic conductivity that allows for the full WQV to infiltrate within 2-3 days. Similarly, there is no information concerning the depth of groundwater. A typical requirement is to build infiltration chambers so their bottoms are 2-3' above the seasonal high groundwater level. Otherwise, the chambers may always be full or partially full of groundwater and not function.

There is no provision for sediment storage in the infiltration chambers. Sooner or later, the 6-9" of dead storage in the chamber bottom will accumulate sediment. In addition to the possibility of reducing the infiltration rate, the sediment also reduces the dead storage volume. This reduces the ability of the system to remove contaminants.

Infiltration areas should have provision for periodic maintenance. One small inspection port at each end of a row plus every 100' may or may not be enough. There should be detailed information showing how sediment can be removed from the underground galleries. The information should include the equipment to be used, the size, configuration and spacing of access ports, etc. If the chambers cannot be maintained by equipment operating through access ports, it will be necessary to excavate and rehabilitate the infiltration areas. Some are located near the proposed buildings.

Considering the above, we recommend that the project not be approved by the Commission until such time as the plans are revised to include a stormwater management plan that is in compliance with the DEEP General Permit.

If approved as depicted on the application drawings, runoff from the project may be discharged to the wetlands and watercourses with inadequate treatment. This can reasonably be expected to result in the discharge of more contaminants than are currently discharged from the site and lead to degradation of resources on and downstream from the property.

Erosion and sedimentation, stormwater runoff, and nonpoint sources of pollution caused by the addition of impervious surfaces within the watershed will contribute to the degradation of water quality. Stormwater runoff typically carries suspended solids, nutrients, hydrocarbons, heavy metals, bacteria, and road salts. Lawn care fertilizers are a source of phosphorus, one of the major causes of eutrophication. Because most phosphorus is adsorbed to soil, erosion appears to be the main mechanism of phosphorus transport to lakes and reservoirs from residential development.

We recommend that the applicant prepare a comparison of pollutant loading. The analysis should compare the amounts of nutrients and sediment discharged from the property if developed as proposed vs. the amount of nutrients and sediment discharged from the property as it exists today. There should be a separate analysis for each point at which runoff exits the property.

The comparison should include the discharge location of each infiltration area and each part of the site that does not drain to an underground stormwater infiltration area individually.

The comparison could be made using the appropriately named "Simple Method" developed by Thomas Schueler or by more sophisticated methods (SWMM-5, etc.). The purpose of the loading analysis would be to determine whether the project can reasonably be expected to discharge more suspended solids and nutrients than would be discharged from the project area under existing conditions. If the loading analysis shows an increase in sediment or nutrients discharged from the proposed project, then the plan should be revised to eliminate the increase. This may take the form of reduced disturbance area, improved stormwater treatment, reduced impervious coverage, etc. This is analogous to long-standing requirements to avoid increases in flood flows resulting from development.

Infiltration Area B3a has insufficient cover. The minimum requirement stated by the manufacturer is 12" in pavement or 18" unpaved.

Infiltration Areas D1, E1 and F1 have more than the 8.3' of cover allowed by the manufacturer.

The table of infiltration area dimensions and elevations has an error for Infiltration Area E3b. The bottom elevation should apparently be less than 273, not 173, as shown.

Some roof drains are connected directly to the infiltration chambers, not to the separators. This should be changed. The roof runoff can reasonably be expected to include fine solids, debris, etc. so removal of at least part of these will extend the time between infiltration maintenance events.

We are unable to locate details for outlet structures with orifices. We found only outlets with weirs.

There are some (not all) flow routing calculations for the revised watershed E analysis, but not for the other watersheds. Without these, we are unable to verify that the chamber storage for each infiltration area is adequate.

There is something wrong with the watershed I analysis. The drainage report divides watershed I into two watersheds, I1 and I2. There is a WQV calculation for I1, but not for I2. The table of infiltration area structures on sheet 18 of the drawings lists infiltration areas for watersheds I1 and I3, indicating that there should be WQV calculations for I3.

The project proposes to convey runoff from parcels A and E (watershed B) to Mill Street, then discharge it to Far Mill River by constructing a new pipe crossing Mill Street to the edge of the river. There is no pipe discharge at this point, and the vicinity is extremely rocky with ledge outcrops. We recommend that the exact location of the outfall be determined in the field in consultation with city of Shelton staff to reduce tree removal and select a location that will not cause river scour. The plans should include erosion controls and a restoration plan.

FLOW ATTENUATION

The section in the drainage report on Watershed E does not include a stormwater discharge rate summary comparing existing to proposed conditions.

The WQV provided for infiltration area G3 is less than the required volume.

There is an increase in the 2-year flow to the culvert conveying watershed F runoff across Bridgeport Avenue. This flow (and all other flows exiting the site) should be reduced to comply with the DEEP general permit.

The drainage report includes reference to Watershed K, but no such watershed appears in the calculations or on the watershed map.

The calculations for most (not all) watersheds refer to 90% removal of suspended solids from stormwater runoff, but this removal efficiency is not supported by calculations and is not required by regulation.

There are no revised watershed maps showing the corrections made to the drainage analysis concerning the flow from watershed A into watershed E.

The outdated watershed map is too small to review and is not drawn to a known scale. All comments herein related to the stormwater system assume that the watersheds were correctly delineated, measured and incorporated into the analysis, but we have not been able to verify that.

Based on the calculations, the total watershed area under existing conditions is 204.63 acres, and the proposed total watershed area is 197.26 acres, a reduction of 7.37 acres. There is nothing on the watershed maps to show where the watersheds could be reduced. The totals should be the same.

Compliance with the DEEP general permit will require that discharges comply with the stream channel requirements. The culvert is about 150' south of Long Hill Cross Road at the outlet of wetland D. This will result in proposed conditions discharges to be significantly less than existing discharges.

OPERATION & MAINTENANCE OF STORMWATER FACILITIES

The stormwater facilities are to be maintained permanently by the property owner. Failure to maintain the infiltration facilities, hydrodynamic separators and other stormwater collection, storage and treatment components may reasonably be expected to result in the failure of the system to protect the wetlands and watercourses from pollutant discharge, increased flooding and accelerated erosion.

The drainage report states that drainage systems are to be maintained according to the approval conditions of the various agencies having jurisdiction. Because it is not the Commission's job to prepare the maintenance requirements to form the approval conditions, we recommend that the applicant prepare a formal written operations and maintenance plan for the Commission's review. This does not represent an additional burden on the applicant, as he is required to prepare such a plan for the DEEP general permit.

The single-page listing maintenance items for each parcel that appears in the drainage report is not adequate.

1. It requires a schedule for each task.
2. It should include sweeping of the pavement periodically (Fall before snow, Spring after snow) to reduce the amount of sand reaching the system.
3. It should include provisions related to management of snow removal, which can result in large piles of sand and salt concentrated in a few places.

Trinkaus Letters and Swift Responses

There have been two letters prepared by Steven Trinkaus, PE; and James Swift, PE, has submitted a response to each. Many of the Trinkaus comments refer to non-compliance with the DEEP "Stormwater Quality Manual," and many of the Swift responses state that the Manual is not a regulation and compliance is not required. To clarify, and without re-stating each topic in the letters individually, we recommend that the project be designed in substantial compliance with the Manual. Mr. Swift is correct in stating that the Manual is not a regulation, but compliance with the DEEP General Permit does require compliance with the Manual. If the Commission approves the project without compliance with the Manual, there is a risk that subsequent revisions to achieve compliance with the DEEP general permit would change the project in ways that the Commission may or may not have originally approved.

On Page 12 of the 3/28/18 Swift response letter, there is a statement that the project does not rely on infiltration for stormwater management. This is not correct. The project relies on infiltration for retaining the WQV on site, as required by the DEEP General Permit as well as capturing the WQV for water quality purposes.

If the proposed underground infiltration system can be shown to be viable, the issue of thermal effects (hot water from impervious areas having a negative of watercourses) is addressed. Otherwise, thermal effects remain a potential adverse impact.

Miscellaneous

We were unable to find a construction detail for the mitigation wetland to be established near Buddington Road.

The discharge of stormwater to the mitigation wetland is through a "level spreader" (perforated pipe in stone envelope). This type of discharge can be prone to clogging as the filter fabric around the stone envelope becomes clogged with sediment. We recommend a different type of discharge or additional cleanout ports.

Runoff from Parcel C is to be conveyed by a pipe, then a swale, to Wetland G. This represents a new concentrated discharge to the wetland and can reasonably be expected to cause scour of the wetland. We recommend that the design be revised to eliminate this condition causing scour. In addition, the additional discharge may cause accelerated erosion of a downstream wetland on private property.

In Parcel E, there are three drains within a parking structure. Nearby notes show roof drains to be connected to the infiltration areas, so we assume these three drains are not roof drains and are within the parking structure. If so, they are required to be connected to the sanitary sewer, unless they are on an open parking deck.

Sincerely,

LandTech

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File: Towne Center at Shelter Ridge - LandTech - IWC - Municipal Review 9-10-19