PROJECT SITE DESIGN AND DRAINAGE REPORT

FOR

BLOCK 55 LOT 2
DELAWARE TOWNSHIP
HUNTERDON COUNTY, NEW JERSEY
July 28, 2020

Prepared for:

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For
28 Sandy Ridge Road
Stockton NJ 08559

REV 1 – 05-28-2021
REV 1 – 07-12-21 – NARRATIVE ONLY

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I. PROJECT LOCATION, DESCRIPTION, AND EXISTING CONDITIONS

The project site is located on the South side of Sandy Ridge Road, in Stockton, about 850 feet east of the intersection of County Route 523 (Sergeantsville Road). Historically the site has been and is part of an active farm owned by the family. The general location and surrounding areas are shown in Figure 1

Figure 1

The site is located on Block 55 Lot 2 which consists of a parcel of land that is 30.078 (acres (gross) as bounded by Sandy Ridge Road and adjoining lots. There is one existing 75" wide overhead wires utility easement on the west side of the lot for PSE&G. In addition, there is a proposed 50' wide underground natural gasline easement reserved for Penn East for if and when there may ever be approval for that project. Thus, the westerly 125' of the lot is reserved for utility easements. The north end of the lot fronts on Sandy ridge Road with the title line for the lot shown as being approximately in the center of the 50' right of way for Sandy Ridge Road. The lot is bound on the east side by a 50' wide driveway which is part and parcel of Lot 2.03 (the home lot for the farm) also owned by the Switzler family.

The site has access from Co. Rte. 523 through Sandy Ridge Road. The road has an average paved width of 20+- feet. With gravel shoulders about 1 foot wide. The drainage along the frontage is a surface ditch that flows both east and west in the vicinity of the site. Proposed access to the site is to be through an existing farm road access driveway located just outside of the easements on the west side, Figure 2 depicts the location of the existing farm access.

Figure 2 - Farm Driveway

The area proposed for the Tennis Training Center (TTC) is currently in long-term hay meadow cover, as is all of Lot 2 except for hedgerows and the tree line along Sandy Ridge Road. Figures 3 and 4 are onsite photos of the approximate location for the facility.

Figure 3 – View Easterly along Hedgerow near proposed parking and storm basin

Figure 4 – View northwesterly through proposed location for facility

In discussions with the Board of Adjustment at the first Public Hearing it was requested that the applicant note that the proposed subdivision of lands would include use of emaining lands. In that case the current plans show an approximate equal division of the land into two lots, one for the Tennis Center, the second for a potential Single-Family Dwelling (SFD) on lands which would be considered agricultural uses except for the SFD exception. Soils logs for a potential SFD location are scheduled but could not be done until June 1-=2. 2021.

A review of the current versions of NJDEP GeoWeb and the NJDEP Land Use Permit Screening Web Applications place the property in the Skylands Landscape Project area, wherein the information database does not catalog presence or observation of species of interest on the parcel under its #1 ranking. The site is also located in the Delaware and Raritan Canal Comm Review Zone: B which will require submission of copies of plans and reports prepared as defined in N.J.A.C. 7:45.

Currently, on the site, there are no defined drainage features. The drainage area for the TTC, which is to be located just north of the existing hedgerow has four (4) subareas, Figure 7, draining to a point on the west side on Driveway of Lot 2 in the vicinity of the hedgerow in the field (Figure 6). The first subarea is the offsite lands east of the driveway to Lot 2.03 which flows to an existing 12" culvert located just north of the hedgerow south of the TTC location, Figure 5.

Figure 5 Culvert Location Driveway Lot 2.03

The second sub area is from the height of land south of the hedgerow that drains 3.06 acres of meadow through and along the hedgerow, Figure 3, showing front side of hedgerow

The third sub area is a narrow band of drainage accumulation that picks up the culvert from the east and flows along the Hedgerow, Figure 6

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Figure 6 Subarea 3 along Hedgerow

Subarea 3 picks up Subarea 1, Subarea 2 south of the hedgerow, and Subarea 4, the remaining onsite drainage from the area along Sandy Ridge Road, Subarea 4 (9.82 acres). The surface swale in the area along the hedgerow is densely covered with woody and herbaceous growth and has no defined bed or bank, Figure 6. On the westerly property line, the hedgerow is also a densely vegetated hedgerow, Figure 7.

Figure 7 – Westerly Hedgerow

From that discharge point the flow is westerly across adjacent Lot 8, which is also in a meadow condition. There is no defined flow pattern crossing the fields see Figure 1. Figure 8 below is the

general outline of the drainage areas for the site plan. The initial development of the drainage areas for offsite lands was by using a program called Stream Stats, which electronically determines a drainage area based upon the closest point of a known drainage feature, which in this case occurs on Lot 8 in the near vicinity of the horse exercise area as shown in the aerial image on Sheet C-2. and in Figure 9

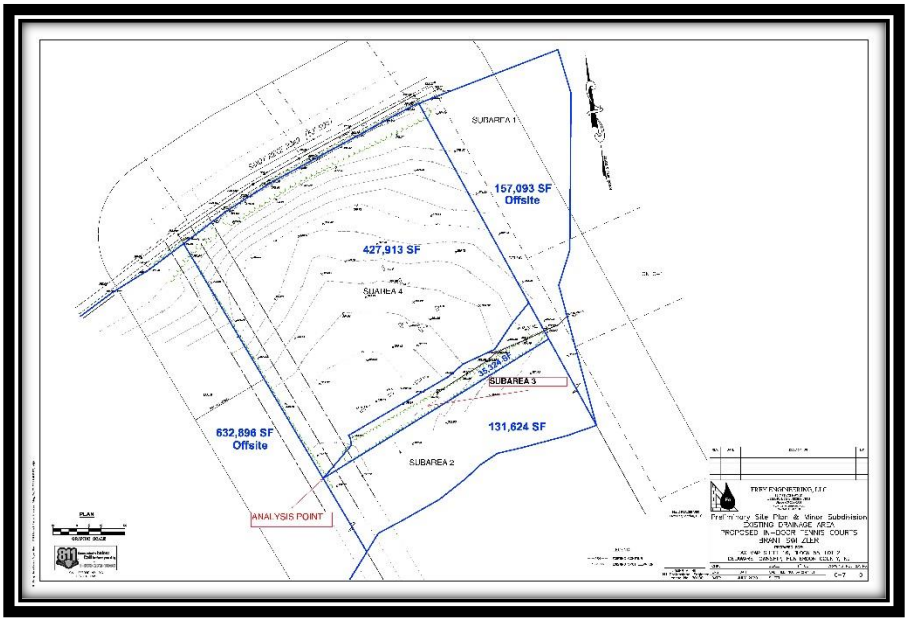

Figure 8 Existing conditions drainage

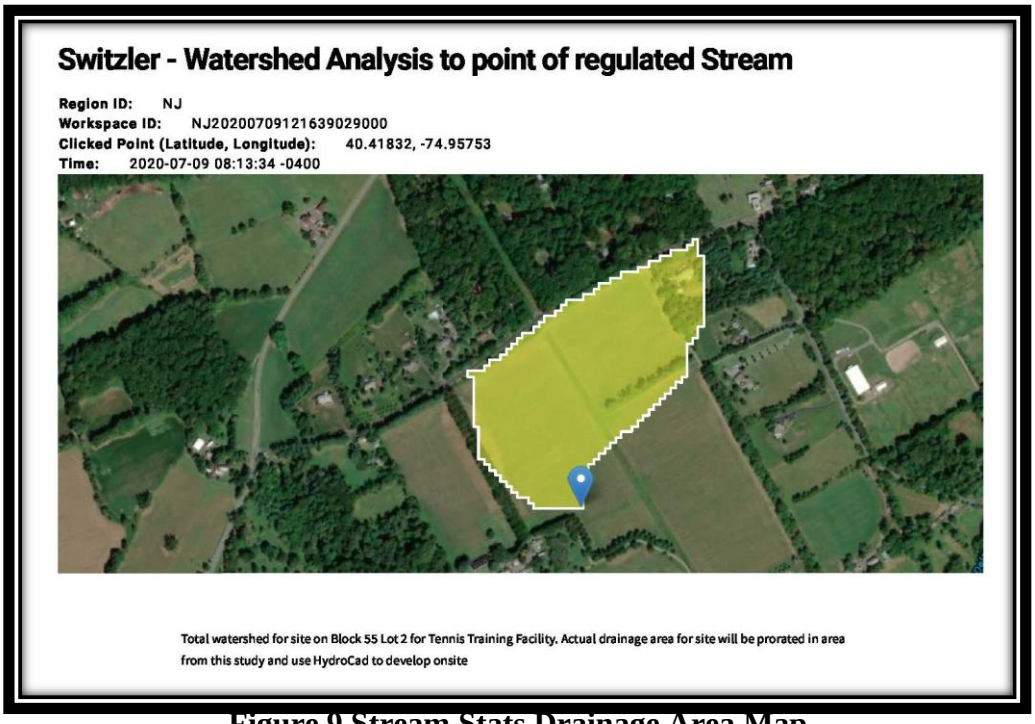

Figure 9 Stream Stats Drainage Area Map

The soils for the site are shown on Sheet C-2 Existing Conditions, derived from the online USDA Basically, on the TTC portion of the site there are 3 soils units noted in the table

USDA-NRCC WEB SOIL SURVEY		
Map Unit Symbol	**Map Unit Name**	**Hydrologic Soil Groups (HSG)**
AbrB	Abbottstown silt loam, 2 to 6 percent slopes	C
HdyC2	Hazleton channery loam, 6 to 12 percent slopes, eroded	B
LbmB	Lansdale loam, 2 to 6 percent slopes	B
LbmC2	Lansdale loam, ^% to 12% slopes	B

II. PROJECT DESIGN METHODOLOGY AND CONSTRAINTS

This report is intended to analyze the changes in site conditions, on and offsite, changes in storm water runoff between the existing and proposed conditions plans, and generally anticipated changes in overall use of public facilities (roads). This analysis is in support of the request for approval for a change in use from Agricultural to Commercial status, and for Preliminary and Final Site Plan.

A. Stormwater Management

For Stormwater Management the standard requirements to meet are found in the NJDEP 2004 Regulations under N.J.A.C. 7:8, as amended to date, the Delaware Township Storm Water Ordinances (which incorporates N.J.A.J. 7:8), the Delaware Raritan Canal Commission regulations for Zone B, and for Soil Erosion Control the USDA-NRCS Chapter 251 regulations.. All regulations are used as guidance for controlling peak storm flows from the site, for required recharge to groundwater, and for control of erosion on the site. In that the plans were filed for review prior to March 1, 2021, the updated requirement sin the March 2021 regulations do not apply.

The site plan, as proposed, is considered a Major Development under the regulations noted above. Lot 2 currently is comprised of 30.08 acres of which approximately 14.1 +- net acres will be assigned to the TTC and the remainder of 6.0+- acres (including flag lot stem) will be divided off divided off if the use variance is approved. The new proposed lot size being dedicated to the site plan for the TTC is for the purpose of keeping the imperious cover below 10% as required by the A-1 zone. The gross area of this portion would be 13.71 acres with 0.366 acres dedicated to the 50’ right of way for Sandy Ridge Road. The flag stem for the other lot will occupy 50 feet of the road frontage.

Of the 13.1 acres approximately 4.29 acres will be disturbed for the purpose of installing the TTC, of which 1.11 acres is considered impervious, which creates the need for the net size of the lot be 11.84+- acres of the 13.1 acres being provided. The remainder of the proposed new lot will be maintained in long-term hay meadow or lawn with five (5) plus acres in meadow to maintain agricultural use on the new lot and lands remaining. The lands remaining for the subdivision of Lot 2 (16 +- acres) will continue in long-term hay meadow with a SFD exception area.

B. Proposed Use of Site

As previously noted, the TTC will consist of a single Agricultural style building 120’ wide by 140’ long, with the long side paralleling Sandy Ridge Road. Uses in the structure will be two (2) standard size tennis courts for daily use for classes and recreational play, a viewing area, office,

pro-shop, exercise gym, and an apartment for the manager upstairs. The facility will be open seven (7) days a week from 8:00 am from November to March with the anticipation that outdoor facilities in the area would function from June to October. The use of the site is shown in Table 1.

Time	Mon	Tues	Wed	Thu	Fri	Sat	Sun
8:00	6	6	6	6	6	4	4
8:30							
9:00						4	4
9:30	6	4	6	4	6		
10:00						8	4
10:30		4		4			
11:00	4		4		4		4
11:30		4		4			
12:00	4		4		4	8	4
12:30		4		4			
1:00	4		4		4		4
1:30		4		4			
2:00	4		4		4	8	4
2:30							
3:00	1	1	1	1	1		4
3:30							
4:00	8	1	8	1	8	8	4
4:30							
5:00		1		1			4
5:30							
6:00	8	8	8	8	8	4	4
6:30							
7:00						4	4
7:30							
8:00							

Table 1 Single Court Anticipated Use

TYPE OF CLASS	NUMBER OF PEOPLE	INSTRUCTOR(S)
Adult Classes:	2-6 people,	1 instructor:
Rented Time:	1-4 people	1 instructor
Private Time:	1 person	1 instructor
Junior Classes:	2-8 people	1-2 instructors

There are two courts proposed with each court being able to function as shown in Table 1. The revisied parking lot of 38 spaces is anticipating overlap between arrivals and departures and parents staying to observe as noted with Table 1, based upon the traffic study conducted for the site.

The Applicant, based upon experience in the business and upon Table 10 indicated the following need for parking.

"Above *is the max capacity schedule for the single indoor court. This kind of schedule would likely operate between November and March.* ***June through October business would take place on existing outdoor courts in the area****. The number in the top right corner of each box represents the maximum number of attendees for each time slot.*

The parking lot would have to be able to accommodate a maximum of 24 cars. Assuming a junior class has 8 kids, and there are two classes back to bac. At 6:00pm there would be 8 parents picking up and 8 parents dropping off, plus potentially 2 instructor cars. No other class has the potential for this many people at once. A 24-car parking lot should be able to always fit the maximum class size with 6 miscellaneous spots still available.

The driveway would have to be able to handle 45-70 entrances and exits throughout an 8:00am-8:00pm workday. As illustrated above, most of the traffic would occur in the mornings and evenings during group classes. "

To follow up on the analysis. The center would be able to operate 10 hours a day, with the 4:00 pm to 8:00 pm classes creating the peak use of the driveway entrance. During those periods there would be 24 round trips at 4:00 pm to 8:00 pm. That is 12 trips in and 12 trips out split by the time of the classes. The maximum use would be at the end/beginning of classes. On Saturday this peak would shift to 10:00 am to 6:00 pm. With two courts the need is for 45 spaces with one (2) Handicapped space as required by ADA regulations and guidelines.

C. Environmental Features of Concern –

Using the Online Screening Programs from NJDEP Geo Web and NJDEP Land Use Permit Screening Web Application programs the following information was obtained

1. Wetlands – No Wetlands are mapped on Lot 2 in either program, a site inspection by Environmental Technologies Inc. has been conducted and the results are forthcoming.
2. Well Head Protection – the site is not located in the well head protection zone for Community or Non-Community systems. The nearest Community area being on the westerly half of Lot 8 adjoining to the west. It is presumed the well will be installed under the Non-Community designation by the Hunterdon County Department of Health Service.
3. The site is not located in or near any FEMA/NJDEP delineated floodplain areas
4. The site is mapped as Grassland, Rank 1, No related records were found for various species of concern.
5. The site is mapped in the Central Delaware Recharge area (groundwater recharge, Rank B 10-14 inches per year). Under the stormwater management plan the area meets the requirements for annual recharge.

The project site is noted in the Delaware Township ordinances as containing soils of Statewide Importance (Class III – attachment 9) and/or Prime Farmland Soils – Classes I and II attachment 13). Under the Ordinance noted as "Comprehensive Farmland Preservation Plan" dated 12/10/2007, amended 12/13/2011, there are directives toward preservation of Prime and Statewide Soils. Section F.2.f Land Disturbance Restrictions indicates that Class I soils be limited to 10% disturbance, Class II soils to 20% disturbance, and Class III soils to 30% disturbance. The classifications from the 2011 ordinance appear to be in sync with soils mapping for Hunterdon County from the 1974 published survey as shown in Table 2. The soils mapping from the USDA-

NRCS Web Soil Survey (online) shown on plans and used in reports is an update of the classifications as, again, shown in Table 2, and Figure 18.. In that agreement is needed from the LUB and professionals on the assignment of the characteristics, the percentages of disturbance have not yet been finalized. Also to note even allowable residential use of the proposed lot for the Tennis Center (14 acres +-) would potentially violate the percentages noted in the ordinance due to having to cross narrow bands of soils such as the LbmB Lansdale, which occupies 180,918 s.f. of which a 125' wide strip is taken up by utility easements (75' & 50'). This utility strip is part of the facility lot. The power line easement would represent a 28,500 s.f. loss or 16% of the 20% allowed. The potential underground pipeline easement would use up 19,000 sf or 10%, so the lot is already over by 6%. Do to the fact that the pipeline areas are now required to return land to previous farmland use the powerline easement only leaves 4% for the tennis center or other uses. With regard to returning the land to farmland use there are acceptable farming practices, such as "Pollinator Habitat" which under the current USDA-NRCS – Environmental Quality Incentive Programs (EQIP) on as little as ¼ acre. This habitat is described as ***Pollinator Habitat***

Pollinators are vital to the agricultural industry. As honey bee colonies continue to decline, it is even more important for farmers to attract native bees, wasps, flies, and other pollinators to their crops. Providing nectar, pollen, and larval food sources for pollinators, and year-found habitat can attract and sustain these species. Field borders, center pivot corners, and other odd areas around the farm are suitable for pollinator habitat.

This agricultural use do to its long term no disturb concept could be use to revegetate any disturbed area outside of the septic system, driveway, building and geopave with long-term agricultural use. The exact amount of disturbance under the ordinance needs to be discussed before the percentages are assigned.

TABLE 2 FARMLAND SOILS – per attachments 9 and 13, 1974 Soil Survey			
Map Unit Symbol		**Map Unit Name**	**Prime/Statewide Classification Hunt Co./Delaware Twsp**
Web soil survey	**USDA 1974 SOIL SURVEY**		
AbrB	AbB	Abbottstown silt loam, 2 to 6 percent slopes	III (30%
HdyC2	HaC 2	Hazleton channery loam, 6 to 12 percent slopes, eroded	III (30%
LbmB	LaB	Lansdale loam, 2 to 6 percent slopes,	II (20%)
LbmC2	LaC2	Lansdale loam, ^6% to 12% slopes, eroded	III (30%)

III. STORMWATER MANAGEMENT - EXISTING 2020 SITE CONDITIONS ANALYSIS

The existing drainage area conditions for those portions of lot 2 proposed for site plan, including offsite drainage on the northeast quadrant and south of the hedgerow, is 17.26+- acres as shown in Table 3, and depicted in Figure 8.

TABLE 3 – EXISTING SITE CONDITIONS (751,954 S.F. ENCOMPASSED)			
SUB AREA	TYPE OF COVER	AREA (S.F.)	PERVIOUS/ IMPERVIOUS
1	EXISTING SFDS, ON 2+ ACRE LOTS 12% IMPERVIOUS	157,093	PERVIOUS 88%
2	MEADOW SOUTH OF HEDGEROW	131,264	PERVIOUS
3	HEDGEROW/MEADOW SOUTH OF SITE PLAN	35,324	PERVIOUS
4	SITE PLAN AND REMAIING LANDS	427,933	PERVIOUS

The existing single-family dwellings, in subarea 1, on east side of driveway for Lot 2.03 are heavily wooded or brushy outside of the cleared areas for the homes as seen in Figures 10 and 11. They drain to the south along the driveway to the 12" culvert.

Figures 10 & 11

The general continuous hay meadow conditions are sub area 4, for the area to be developed, is depicted in Figure 12.

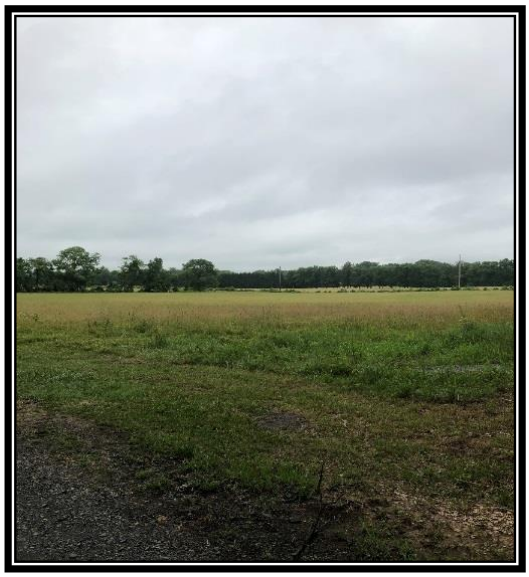

Figure 12 Site Plan area as viewed from lot 2.03

TABLE 4 is a synopsis of peak flows from the Hydro Cad™ program analysis for existing conditions, with the areas, as defined in the ordinance, totaled in the program for each site condition shown in Table 1. The actual areas were figured from AutoCAD™ drawings from each site condition presented. Table 5 provides the NJAC 7:8 required peak flow reductions for the 100, 10 and 2-year storms, as measured at the westerly property line (these flows include the unchanged contribution of the offsite drainage areas which will not change in cover type).

TABLE 4
EXISTING CONDITIONS PEAK FLOWS
NO STORMWATER CONTROL FOR TOTAL SITE
AT SOUTHWEST PROPERTY LINE W/ LOT 8 (LINK EXISTING)

STORM EVENT	PEAK Q(CFS) MAIN LOT ONSITE TO WEST PROPERTY LINE	+PEAK Q(CFS) OFFSITE AND HEDGEROW SWALE	TOTAL additive SITE PEAK Q (CFS)^	*TOTAL combined SITE PEAK Q (CFS)
NJWQ	0	0.15	0.15	0.15
2-Year	1.57	2.34	3.91	2.88
10-Year	7.59	5.66	13.25	11.85
25-Year	12.79	8.41	21.20	19.75
100-Year	23.59	13.77	37.16	35.74

^ PEAKS ADDED TOGETHER GENERALLY EXCEED COMBINED PEAKS DUE TO TRAVEL TIME TO ANLALYSIS POINTS BEING DIFFERENT.
+ OFF SITE PEAKS ARE NOT CONTROLLED BY SITE PLAN AND DO NOT REQUIRE REDUCTION
*COMBINED FLOW MERGES THE PEAKS OF ON AND OFF SITE

TABLE 5
EXISTING CONDITIONS REDUCED PEAK FLOWS
REQUIRED BY NJAC 7:8
AT SOUTHWEST PROPERTY LINE W/ LOT 8 (LINK PROPOSED)

STORM EVENT	REQUIRED REDUCTION	MAIN LOT PEAK	**REDUCED MAIN LOT PEAK**	OFFSITE PEAKS **NO REDUCTION**	***REQUIRED PEAK TOTAL FLOWS AT PROPERTY LINE**
	N/A	0	**N/A**	0.15	**N/A**
2-Year	50%	1.57	**0.79**	2.34	**3.13**
10-Year	25%	7.59	**5.69**	5.66	**9.35**
25-Year	N/A	12.79	**N/A**	8.41	**N/A**
100-Year	20%	23.59	**18.87**	13.77	**32.64**

***COMBINED FLOW MERGES THE PEAKS OF ON AND OFF SITE**

IV. PROPOSED SITE CONDITIONS

The application before the Zoning Board of Adjustment calls for approving a commercial use in an Agricultural zone. The applicant proposes to construct and operate a minimal Tennis Training Center on the north end of Lot 2, just north of the existing hedgerow, see Figure 13.
The facility will consist of one structure, a 120' x 140' simple agricultural style (barn) building with 40' peak height and low eave elevation, with colors to blend in with the agricultural uses in the area. The building will house two (2) tennis courts and on one end a two-story space for a small gym/viewing area, bathrooms, offices, laundry and pro-shop. There will be a twenty-four foot (24') wide paved driveway with a parking area behind (south of) the building. The parking will be primarily Geo-pave unit asphalt paving only for the Handicapped spaces, with landscape island for 38 parking spaces as shown in Figure 13 and on Sheet C-3

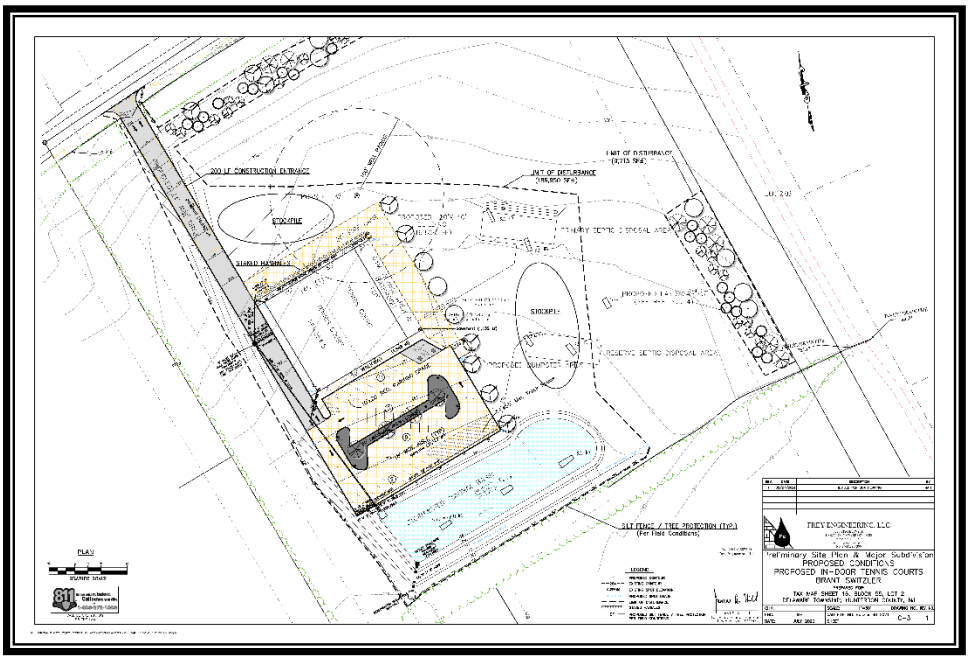

Figure 13 – Proposed Site Plan

Also, as shown in Figure 13 and on Sheet C-3 of the plans there are proposed landscape berm areas along Sandy Ridge Road and west of the driveway to Lot 2.03 to mitigate views to the site from nearby single-family dwelling locations. Figures 14 to 16 show existing views to the site from Sandy Ridge Road as viewed from the road. The road surface is approximately 10' above the first floor of existing single-family dwellings on the north side of the road. Figure 12 shows the view toward the site from the. Driveway for Lot 2.03

Figure 14 View to Project Site from Existing Farm driveway west side of lot

Figure 15 View to Project Site from mid-point of Lot 2

Figure 16 View from Road East, from near existing farm driveway

The site was analyzed for developed conditions for stormwater peak flow and storage, based upon the use of an Infiltration Basin under NJDEP BMP 9.5 for the developed portion. In addition, the Geopave units on the parking lot also meet the requirements of BMP 9.7 for pervious paving and provide as a forebay for any runoff from the paved areas. The GeoPave has not been included in the infiltration capacity needs for the site but will add additional recharge above and beyond that required by NJAC 7:8. Additional GeoPave units have been added for use as a fire lane around the building.

The proposed area for the basin was tested for infiltration rates, during septic system testing, under Appendix E of NJAC 7:8. The result was a Soil Permeability Class Rating of K3, bumped down to K2 (0.6 – 2"/hr.) due to over 55% fine and very fine sands. In the same vicinity a Pit Bail Test was conducted with a 2"/hour result. Under BMP 9.5 the allowed infiltration rate is 1" per hour, to meet the factor of safety reduction of 2 required for permeability. The roofs will be piped directly to the main basin. All of the flow reduction required will take place in the developed portion of the lot. Offsite areas will continue to drain as found in the existing conditions. The developed conditions peak flows, at the westerly property line are outlined in Table 6. As noted, the full requirements of NJAC 7:8 have been met.

TABLE 6
PROPOSED CONDITIONS PEAK FLOWS
WITH STORMWATER CONTROL
AT WESTERLY PROPERTYLINE BY HEDGEROW

STORM EVENT	REQUIRED PEAK Q (CFS) From Table 4	PEAK FLOWS PROVIDED (PROPOSED FLOWS)
NJWQ	**N/A**	0.16
2 - Year	**3.13**	2.61
10-Year	**9.35**	7.28
25- Year	**N/A**	10.87
100-Year	**32.64**	17.87

The requirements for groundwater recharge, NJAC 7:8-5.4 are met with the stormwater basin infiltration. According to GSR-32 17,941.6 s.f. of surface is needed, the basin provides 21,000 s.f. A copy of GSR-32 is provided in Appendix C.

About N.J.A.C. 7:8-5.3 Nonstructural Stormwater Management Strategies, efforts have been made in site plan design to comply with the intent noted in 7:8-5.3 (s) "to the maximum extent practicable"

Under N.J.A.C. 7:8-5.3(b):Nonstructural stormwater management strategies incorporated into the design shall:

1. Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss:
    i. All "developed areas" will follow statewide Chapter 251 standards for erosion control during construction, and subsequently revegetate all disturbed slopes, septic area, stormbasin, and berms with seed mixes which meet the current requirements of said regulations and guidance. All areas outside of the Limits of Disturbance will be maintained in the current hay meadow conditions. There are not steep slopes on the site.
2. Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces,
    i. Except the entrance driveway, handicapped parking and the roof of the facility all areas around the structure and for parking are pervious in nature with the use of Presto-GEOPAVE Permeable Gravel Pavers™ which are also used as a method to introduce BMP 9.7 Pervious Paving Systems for 80% TSS removal and the ability to recharge to groundwater.
    ii. The upper half of the driveway flows to the Bio Retention basin for TSS removal. All other paved areas flow to the GEOPAVE areas. The roof water, which is clean, is directed to the storm basin which is designed as BMP 1 Bio-Retention Basin with groundwater recharge.
    iii. The entire disturbed drainage area of the project eventually flows to the storm basin. The only exception is the westerly slope of the driveway from about the midpoint down which has been returned to grass slopes similar ro existing conditions.
3. Maximize the protection of natural drainage features and vegetation:
    i. All upland not within the limits of disturbance remains unchanged and with the off-site drainage flows to the currently grassed swale just north of the tree line in the middle of the lot. All lands south of the tree line remain in original cover. The point of discharge for the storm basin is protected by properly designed scour basin which discharges at velocities below the maximum allowed for the native soil.
4. Minimize the decrease in the "time of concentration (Tc)" from pre-construction to post-construction. See Figures 18 to 21.
    i. All areas outside or the limits of disturbance do not have a change in the Tc as they are not changed.
    ii. For the developed area and the point of discharge from the property line the Tc is not changed and comparison of peak flows pre and post shows a reduction in off-site flows. The volume of runoff.at the 100-year event drops from 5.167 acre feet in existing condition to 4.616 acre feet in the post conditions
5. Minimize land disturbance including clearing and grading.
    i. The area around the disturbance has been tightened as much as possible.
6. Minimize soil compaction

i. Under the current Chapter 251 requirements the disturbed areas which are being returned to original condition have to be treated with de-compaction methods approved by the local SCD.

7. Provide low-maintenance landscaping and encourage retention and planting of native vegetation and minimizes the use of lawns, fertilizers and pesticides.
    i. Undisturbed lands will continue in an agriculture use on long-term meadow.
    ii. The only areas of lawn proposed for regular maintenance would be over the septic bed and areas of the basin required to be maintained in accordance with NJDEP regulations.
    iii. Use of native species and items such as pollinator plantings will be considered by the applicant.
8. Provide Vegetated open-channel conveyance systems discharging into and through stable vegetation areas.
    i. All areas outside of the LOD will continue to flow through the existing grass swale along the three line.
    ii. All other areas discharge to the propertyline on grassed swale surfaces.
9. Provide other source controls to prevent or minimize the use of exposure of pollutants at the site in order to prevent or minimize the release of those pollutants into stormwater runoff.
    i. There is a trash collection spot on the parking lot for any trash from the builing or parking lot.
    ii. The grates on the stormwater system are NJDEP compliant and will not pass trash downstream. Secondarily the Bio-Retention Basin captures all runoff from disturbed areas and the O&M of the basin will remove any collectables from the surface of the infiltration bed at regular intervals.
    iii. Not applicable.

The scour basin at the outlet for the storm basin is designed in accordance with Chapter 251 SESC controls for a 25-year event. This analysis requires the storm to be calculated as if the infiltration in the basin did not exist. Under the no infiltration analysis, the Proposed Flow to the basin Scour Hole and offsite is 3.37 cfs. Figure 17 is also in Appendix B.

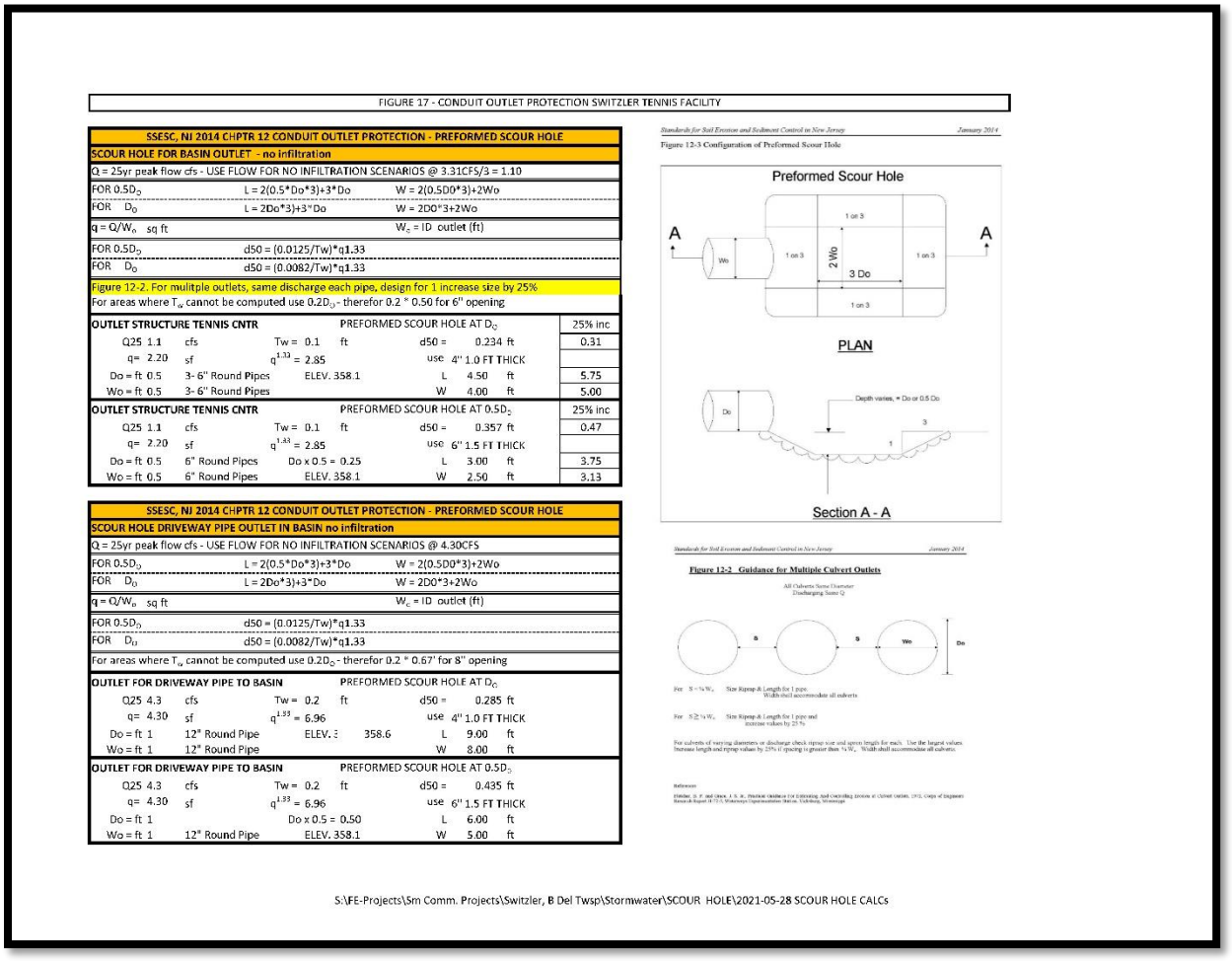

FIGURE 17 - CONDUIT OUTLET PROTECTION SWITZLER TENNIS FACILITY

SSESC, NJ 2014 CHPTR 12 CONDUIT OUTLET PROTECTION - PREFORMED SCOUR HOLE

SCOUR HOLE FOR BASIN OUTLET - no infiltration

Q = 25yr peak flow cfs - USE FLOW FOR NO INFILTRATION SCENARIOS @ 3.31CFS/3 = 1.10

FOR $0.5D_O$	L = 2(0.5*Do*3)+3*Do	W = 2(0.5D0*3)+2Wo
FOR D_O	L = 2Do*3)+3*Do	W = 2D0*3+2Wo
q = Q/W_o sq ft		W_o = ID outlet (ft)
FOR $0.5D_O$	d50 = (0.0125/Tw)*$q^{1.33}$	
FOR D_O	d50 = (0.0082/Tw)*$q^{1.33}$	

Figure 12-2. For mulitple outlets, same discharge each pipe, design for 1 increase size by 25%

For areas where T_w cannot be computed use $0.2D_O$ - therefor 0.2 * 0.50 for 6" opening

OUTLET STRUCTURE TENNIS CNTR				PREFORMED SCOUR HOLE AT D_O				25% inc
Q25	1.1	cfs	Tw = 0.1	ft	d50 =	0.234	ft	0.31
q=	2.20	sf	$q^{1.33}$ = 2.85		use	4" 1.0 FT THICK		
Do = ft	0.5	3- 6" Round Pipes	ELEV. 358.1		L	4.50	ft	5.75
Wo = ft	0.5	3- 6" Round Pipes			W	4.00	ft	5.00
OUTLET STRUCTURE TENNIS CNTR				PREFORMED SCOUR HOLE AT $0.5D_O$				25% inc
Q25	1.1	cfs	Tw = 0.1	ft	d50 =	0.357	ft	0.47
q=	2.20	sf	$q^{1.33}$ = 2.85		use	6" 1.5 FT THICK		
Do = ft	0.5	6" Round Pipes	Do x 0.5 = 0.25		L	3.00	ft	3.75
Wo = ft	0.5	6" Round Pipes	ELEV. 358.1		W	2.50	ft	3.13

SSESC, NJ 2014 CHPTR 12 CONDUIT OUTLET PROTECTION - PREFORMED SCOUR HOLE

SCOUR HOLE DRIVEWAY PIPE OUTLET IN BASIN no infiltration

Q = 25yr peak flow cfs - USE FLOW FOR NO INFILTRATION SCENARIOS @ 4.30CFS

FOR $0.5D_O$	L = 2(0.5*Do*3)+3*Do	W = 2(0.5D0*3)+2Wo
FOR D_O	L = 2Do*3)+3*Do	W = 2D0*3+2Wo
q = Q/W_o sq ft		W_o = ID outlet (ft)
FOR $0.5D_O$	d50 = (0.0125/Tw)*$q^{1.33}$	
FOR D_O	d50 = (0.0082/Tw)*$q^{1.33}$	

For areas where T_w cannot be computed use $0.2D_O$ - therefor 0.2 * 0.67' for 8" opening

OUTLET FOR DRIVEWAY PIPE TO BASIN				PREFORMED SCOUR HOLE AT D_O				
Q25	4.3	cfs	Tw = 0.2	ft	d50 =	0.285	ft	
q=	4.30	sf	$q^{1.33}$ = 6.96		use	4" 1.0 FT THICK		
Do = ft	1	12" Round Pipe	ELEV.	358.6	L	9.00	ft	
Wo = ft	1	12" Round Pipe			W	8.00	ft	
OUTLET FOR DRIVEWAY PIPE TO BASIN				PREFORMED SCOUR HOLE AT $0.5D_O$				
Q25	4.3	cfs	Tw = 0.2	ft	d50 =	0.435	ft	
q=	4.30	sf	$q^{1.33}$ = 6.96		use	6" 1.5 FT THICK		
Do = ft	1		Do x 0.5 = 0.50		L	6.00	ft	
Wo = ft	1	12" Round Pipe	ELEV. 358.1		W	5.00	ft	

Figure 12-3 Configuration of Preformed Scour Hole

Figure 12-2 Guidance for Multiple Culvert Outlets

S:\FE-Projects\Sm Comm. Projects\Switzler, B Del Twsp\Stormwater\SCOUR HOLE\2021-05-28 SCOUR HOLE CALCs

Figure 17 Scour Hole Calculations

The last analysis is called the "blocked outlet" conditions to analyze the impact upon the emergency spillway. In the blocked conditions any flow not stored in the basin must exit the pond through the Emergency Spillway (EMSPY). The maximum flow under this analysis is 9.34 cfs. which flows through a 20' wide spillway, with a crest elevation of 360.80. The flow through the spillway reaches 361.12 or a flow depth of 0.32 feet at 1.33 feet/sec. The soils in and around the EMSPY are Abbottstown silt loams, which in Chapter 251are allowed up to 3.0 feet/sec. This analysis is the last section of Appendix B.

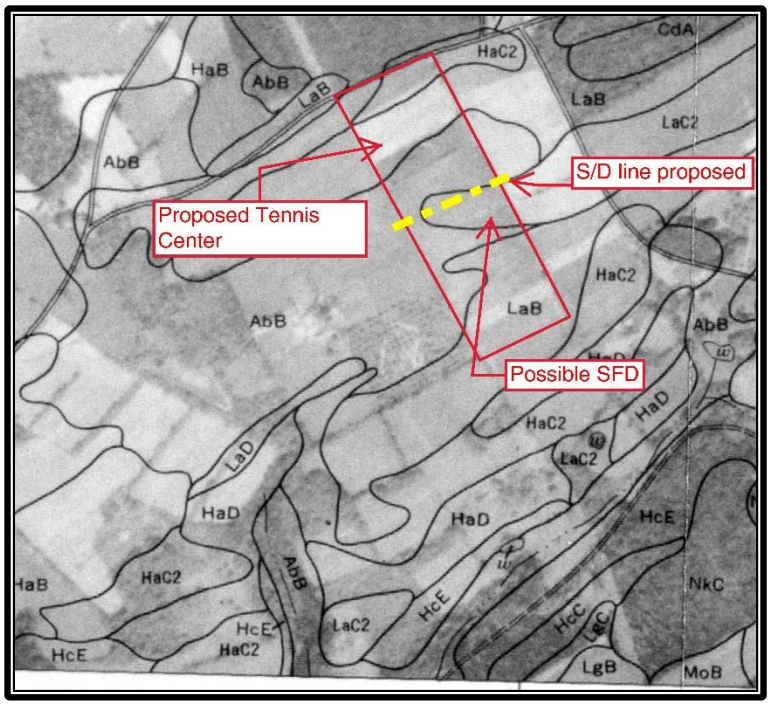

Figure 18 USDA - NRCS 1974 SOIL SURVEY - PORTION SHEET 48

The following Figures compare pre and post peak flows and Tc timing to prove compliance with NJAC 7:8-5.3

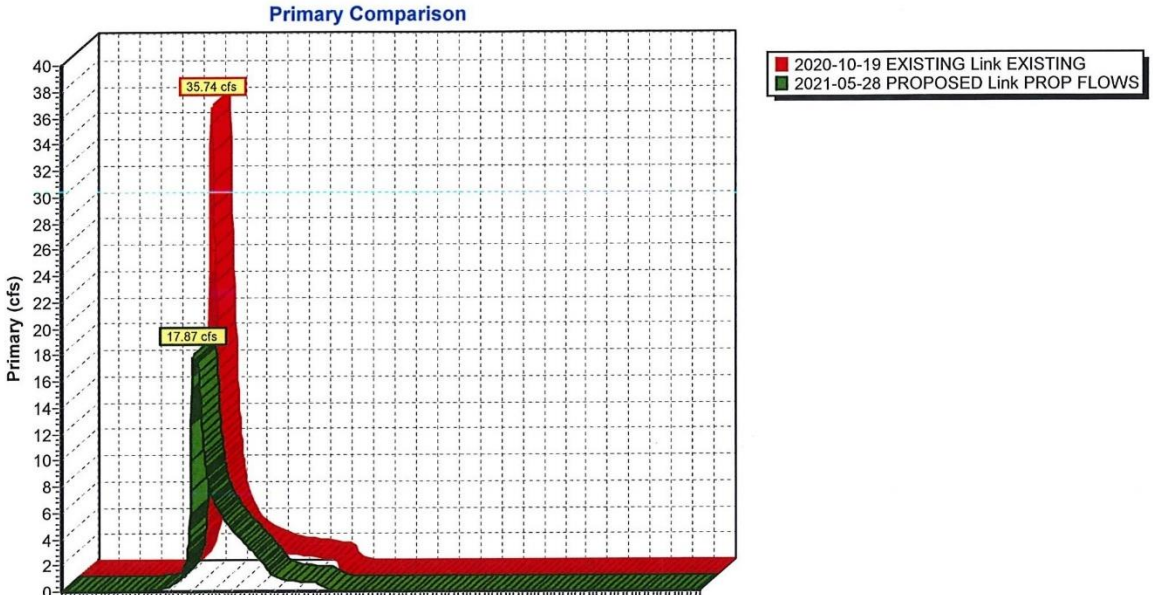

Figure 19 100-year Pre and Post Peak and Tc

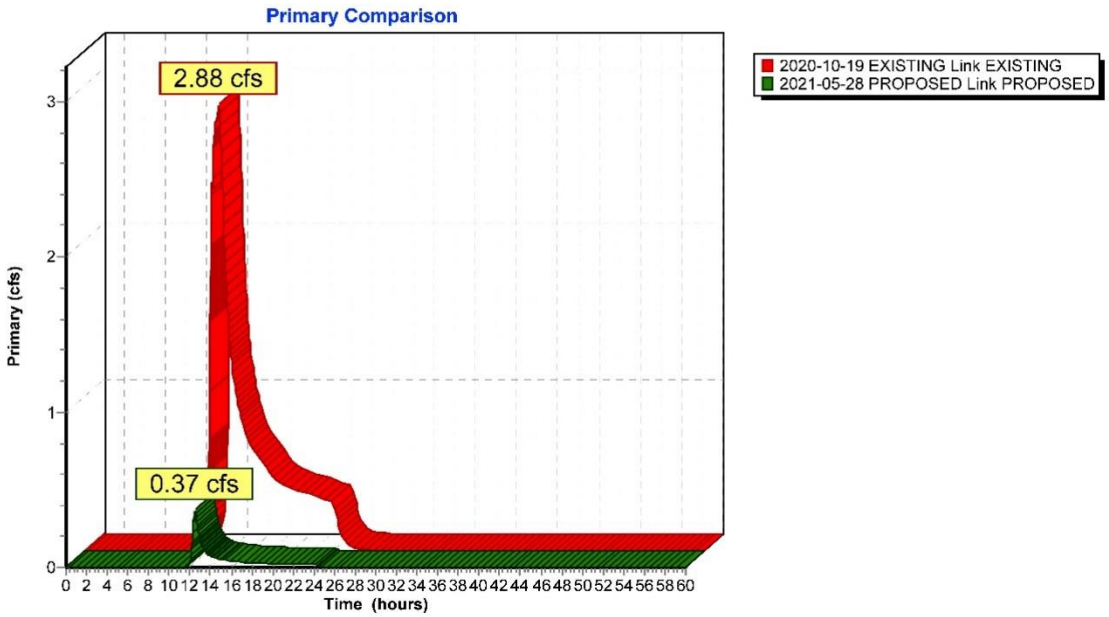

Figure 20 2-year Pre and Post Peak and Tc

Primary Comparison

Time (hours)	2020-10-19 EXISTING Link EXISTING (cfs)	2021-05-28 PROPOSED Link PROP FLOWS (cfs)
0.00	0.00	0.00
2.50	0.00	0.00
5.00	0.00	0.00
7.50	0.02	0.02
10.00	**0.33**	**0.37**
12.50	**32.25**	**16.49**
15.00	3.95	5.75
17.50	2.31	3.42
20.00	1.69	1.16
22.50	1.42	0.74
25.00	0.20	0.16
27.50	0.01	0.00
30.00	0.00	0.00
32.50	0.00	0.00
35.00	0.00	0.00
37.50	0.00	0.00
40.00	0.00	0.00
42.50	0.00	0.00
45.00	0.00	0.00
47.50	0.00	0.00
50.00	0.00	0.00
52.50	0.00	0.00
55.00	0.00	0.00
57.50	0.00	0.00
60.00	0.00	0.00

Figure 21 100-year Table Pre and Post Tc

Primary Comparison

Time (hours)	2020-10-19 EXISTING Link EXISTING (cfs)	2021-05-28 PROPOSED Link PROPOSED (cfs)
0.00	0.00	0.00
2.50	0.00	0.00
5.00	0.00	0.00
7.50	0.00	0.00
10.00	0.00	**0.00**
12.50	**2.60**	**0.36**
15.00	**0.90**	0.05
17.50	0.54	0.03
20.00	0.40	0.02
22.50	0.35	0.02
25.00	0.09	0.00
27.50	0.01	0.00
30.00	0.00	0.00
32.50	0.00	0.00
35.00	0.00	0.00
37.50	0.00	0.00
40.00	0.00	0.00
42.50	0.00	0.00
45.00	0.00	0.00
47.50	0.00	0.00
50.00	0.00	0.00
52.50	0.00	0.00
55.00	0.00	0.00
57.50	0.00	0.00
60.00	0.00	0.00

Figure 22 2-year Table Pre and Post Tc

APPENDIX A
EXISTING CONDITIONS

PREVIOUSLY SUBMITTED – NO CHANGES

APPENDIX B
PROPOSED OR DEVELOPED CONDITIONS

1. **PROPOSED CONDITIONS – BASIN SIZING**
2. **PROPOSED CONDITIONS – NO INFILTRATION – SCOUR HOLE**
3. **PROPOSED CONDITIONS – BLOCKED OUTLET – EMERGENCY SPILLWAY**
4. **SCOUR HOLE CALCULATIONS**

PREVIOUSLY SUBMITTED NO CHANGES

APPENDIX C

GROUNDWATER RECHARGE