WMC
CONSULTING ENGINEERS

87 Holmes Road
Newington, CT 06111

Phone: (860) 667-9624
Fax: (860) 665-1551

April 6, 2020

Mr. William A. Jackson, Chairman
Berlin Inland Wetlands & Watercourses Commission
Berlin Town Hall
240 Kensington Road
Berlin, Connecticut 06037

Re: ***Wetland Permit Application Review***
404 Berlin Turnpike
WMC Project No. 19082

Dear Chairman Jackson & Members of the Board:

We have completed review of the referenced project based on the following new information submitted by the Applicant:

- Response to Comments letter, BL Companies, Matthew Brunton, P.E., Project Manager, March 11, 2020;
- Response to Comments letter, BL Companies, Matthew Brunton, P.E., Project Manager, April 3, 2020;
- Report & Cover Letter, "Hydraulic Analysis of Mattabesset River to Determine Effects of 404 Berlin Turnpike Project", Leonard Jackson Associates, Consulting Engineers, March 11, 2020;
- Technical Memorandum, "Wetland Limit Verification, 404 Berlin Turnpike, Berlin, Connecticut", Tighe & Bond, March 9, 2020;
- Plan Set, Sheets LL-0 through LL-4, "Landscape Plans", BL Companies, last revised 3/10/2020
- Plan Sheet SP-3, "Site Plan", by BL Companies, last revised 3/10/2020
- Plan Sheet WI-1, "Wetland Impact Map", by BL Companies, last revised 3/10/2020

The site of the proposed work is bounded on the east by the Berlin Turnpike (State Route 15), by existing development and the Mattabesset Sewer District ROW to the north, by the floodplain of the Mattabesset River to the south, and a Floodway of a tributary of the Mattabesset River, Webster Brook to the west. Abandoned structures and pavement on the site are to be demolished prior to and during construction. The proposed action is construction of a mix of commercial and residential development including a hotel, retail store, and gas station with a convenience store, as well as five (5) multi-family residential buildings of ±11,200 SF each. Approximately 3,739 SF of permanent

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inland wetland impacts are proposed and the development area is also partially within FEMA AE and regulatory Floodway zones. The site plans have been reviewed for conformance with both the Inland Wetlands and Floodplain Management regulations of the Town of Berlin.

Hydrologic & Hydraulic Analysis

The Applicant has submitted additional hydraulic analyses, in particular to address the potential alternative of providing compensatory storage to offset the fill proposed to be placed within the floodplain and Floodway of the Mattabesset River, within the site of the proposed activity.

The Applicant had previously presented plans showing proposed fill within the floodplain and Floodway totaling ±25,217 CY. At the request of the board, an area to the west end of the property was identified as a site for potential mitigation by excavation, to offset the fill proposed for the development. The mitigation site is almost entirely within the Floodway, with the area not in the Floodway within the floodplain. The mitigation area would be excavated down to elevation 34. The existing condition has some locations up to elevation 41, but generally has elevations in the upper 30's. Plans showed that, as proposed, excavation in this area would remove ±27,262 CY of material.

This site is located in the Town of Berlin, Hartford County, Connecticut. The Mattabesset River was studied in detail in the original Town of Berlin Flood Insurance Study (FIS) published in 1978. Information for the Mattabesset River was incorporated into the Hartford County FIS without further analysis when the countywide FIS was issued. For the proposed activity, the Applicant engaged a consultant, Leonard Jackson Associates, to analyze the impact of the proposed activities on the floods of the river. The consultant submitted a study of the river with the initial application package for this project. At this time the consultant has submitted additional information. The consultant constructed four (4) additional hydraulic models in the latest analysis of the river. As for the prior study, these applications are of the US Army Corp of Engineers computer software for computation of water surface profiles: Hydrologic Engineering Center – River Analysis System (HEC-RAS) computer program. The submitted hydraulic models are applications of the latest version (5.0.7) of the software. The software applications submitted at this time are for the Existing and Proposed conditions at the site, and with each condition analyzed without, and then with, the Floodway boundaries defined at the site. In this submission, the Proposed Condition includes the originally proposed development plus the excavation of the mitigation area. The mitigation area is to be excavated to elevation 34 for an area of roughly a maximum of 1,000 feet by 600 feet. Excavation depths vary from near zero to approximately seven (7) feet.

WMC Consulting Engineers (WMC) has reviewed the hydraulic analysis and supporting documentation and has several observations.

1. Included in the package submitted by the Applicant's consultant is a work map, which includes an aerial image of the area, with a CAD map of the site developed by BL Companies superimposed over the aerial image. The CAD map scale differs from the image scale, so the CAD map was reduced to match the scale of the image. Also overlaid onto the

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image are the hydraulic cross section locations and identification numbers used in the new models. The section locations and ID numbers differ from the previous submission, in part because the analysis was required to extend further west (upstream) to include the mitigation area, which is not directly adjacent to the proposed development. It is observed that the scale of the Floodway boundaries on the work map are not correct. At the FEMA FIS Section S, which is on State Route 15, the published with of the Floodway from the countywide FIS is 98 feet. On the map it is approximately 115 feet wide. The Floodway width at the outlet of Webster brook is similarly inaccurate. Of greater issue, the same information on the CAD mapping of the proposed activity furnish by BL Companies is significantly less accurate. The Floodway width at Section S (at Route 15) in the CAD mapping is more than twice the actual published width. The width of the Floodway of Webster Brook close to its confluence with the Mattabesset River is similarly inaccurate. It appears that the location of the Floodway within the site, and the impacts to the Floodway, cannot be accurately defined by use of these maps. Refer to attached Exhibit A, a properly scaled Firmette from online FEMA Flood Insurance mapping, in comparison to the BL Companies mapping. Note that the flood boundaries and cross section locations are readily available on the internet in a format that can be imported into CAD files.

2. The extent of the modeling is inadequate. The hydraulic model starts at Rt 15 on the downstream end and terminates within the mitigation area at the upstream end. Basic modeling practice is for the model to extend beyond the limits of the affected area. Please refer to Exhibit B, attached herewith. Exhibit B is a section of the HEC-RAS reference manual[1]. Referring to Exhibit A, the model for this project should have started at section R or Q, just downstream of the highway, and continued upstream to section T, just upstream of Webster Brook. As these are locations at which published information is available, the boundary conditions are definable. By terminating the model short at both ends, it cannot be definitively proven that the proposed activity has no effect of flood elevations. WMC had previously sent an e-mail, later forwarded by the Town liaison to the Applicant, requesting that the hydraulic model be extended further downstream. In addition, WMC requested that the Existing and Proposed cross sections be overlaid in the consultant's report, for comparison of the conditions. The HEC-RAS program easily allows for this step. The Applicant has not followed these requests. Neither was addressed in the submission by the consultant.
3. The model cross sections are also inaccurate. The cross sections, which show the ground elevation across the identified locations, are to be used to prove that the topography change by addition of the mitigation area does not affect water surface profiles. In order to effectively prove that a change in water surface profiles does not exist, the Existing and Proposed cross sections must reflect the true existing and proposed topography. Please refer to Exhibit C, attached. Exhibit C shows information taken from the consultant's report for Cross Section 3764, which the work map shows to be near the upstream end of the mitigation

[1] Brunner, Gary B., CPD-69, *HEC-RAS, River Analysis System Hydraulic Reference Manual*, Version 5.0, February 2016, 538 pp, US Army Corps of Engineers, Institute for Water Resources, Hydrologic Engineering Center, Sacramento, CA

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area. The data from the output for the existing and proposed condition HEC-RAS models at the segment of this cross section in way of the proposed mitigation area was entered into an excel file. The vertical line on the plot of the data is the Floodway boundary, as included in the HEC-RAS output in the consultant's report. The blue line is data taken from the Existing Condition output, and the orange line is taken from the Proposed Condition output. The bold green line is the actual configuration of the mitigation area taken from the BL Companies plans for the project, as scaled off the work map. Note that Comment 1 above calls into question the accuracy of the mapping. The location and size of the mitigation area varies between the work map and the CAD map from BL Companies. Reviewing the existing topography in the area of the mitigation site, which is shown on BL Companies plan sheet FZ-2, it appears that the Proposed Condition shown in the consultant's study more closely shows the existing condition topography than the Existing Condition from the consultant's study. In addition, it is clear that neither the Existing or Proposed Co0ndition in any way resembles the actual proposed condition at the mitigation site. Also of concern, beyond the area of the mitigation site the Existing and Proposed Conditions for this cross section do not match. As there is no other development proposed around the mitigation site, the Existing and Proposed Condition topography at this cross section – as well as all the other cross sections located in vicinity of the mitigation site – should be identical beyond the bounds of the mitigation area. For all the cross sections near the mitigation site this is not true. Note Exhibit D, which is the first ten (10) data points for Cross Section 3764, located north of the mitigation area. Roughly, these points are located on the Section 3764 line shown on the work map, near the north property line of the project site. For the first ten points, the Existing and Proposed condition profiles are of similar shape, but entirely different stations and elevations. In order to make a comparison of the existing and proposed conditions in the hydraulic models, the cross sections must be exactly the same beyond the area of the proposed work. In this submission, this condition is entirely not met.

From a practical standpoint, the excavation for the propose mitigation area causes a significant increase in the cross-sectional area of the hydraulic cross sections in way of the mitigation area. Once again, refer to Exhibit C for an understanding of the increase in cross-section area due to the proposed mitigation area. The hydraulic section's cross-sectional area, rather than watershed size, has the most impact on the water surface elevations at a particular location. For these hydraulic models, a fixed volume of water (5,800 FT^3/SEC) is flowing through a cross section that is proposed to gain a significantly area. In addition, the ground elevation of the cross section is lowered by, on average, ±5 feet through the area of the mitigation site. It is highly unlikely that the increased area of the cross sections and lowered ground elevation would not result in changes to the Floodway (encroached) and full floodplain (unencroached) water surface elevations, including the reach of the river at the Town sewerage pump station and the state highway. Furthermore, the Manning's n values (an empirical value representing the "roughness" of the surface over which the water is flowing) is the same in the hydraulic models for the existing and proposed condition at the location of the mitigation site. In the short term (<20 years), the Manning's n value is greatly reduced if the site changes from dense second-growth woods (Existing Condition) to nearly bare (lightly landscaped) and flat (Proposed Condition). A reduced Manning's n value will normally cause an

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increase in the velocity of flow in the affected area. Increased velocity results in increased kinetic energy, which frequently results in increased water surface elevations where transitioning from the altered area to the unaltered area downstream.

WMC finds significant inaccuracies and inadequacies in the hydraulic modeling submitted for this project. Accordingly, we find that it is not possible to draw any conclusions regarding the impact of the proposed activity on the floodplain water surface elevations in the vicinity of the proposed activity, based on the information submitted. The Applicant has failed to demonstrate that the proposed action will not affect water surface elevations of the Floodway on, and nearby, the site of the proposed work.

Site Plans & Stormwater Management Report

1) The Applicant's engineer has provided a response letter to our previous comments dated February 28, 2020. Neither revised plans nor Stormwater Report were submitted as part of their response, rather the corresponding information would be included in future submissions or developed as the Applicant moved forward into the planning and zoning and building permit approvals. While there are comments that could be made part of any conditions of approval, it is suggested that the Wetlands Commission be afforded a comprehensive set of plans that is inclusive of all the comments; in particular items involving more detailed phasing plans that could impact disturbance areas and complete corresponding sedimentation and erosion control plans.

Should you have any questions or require additional information, please contact us at (860) 667-9624, at your earliest convenience.

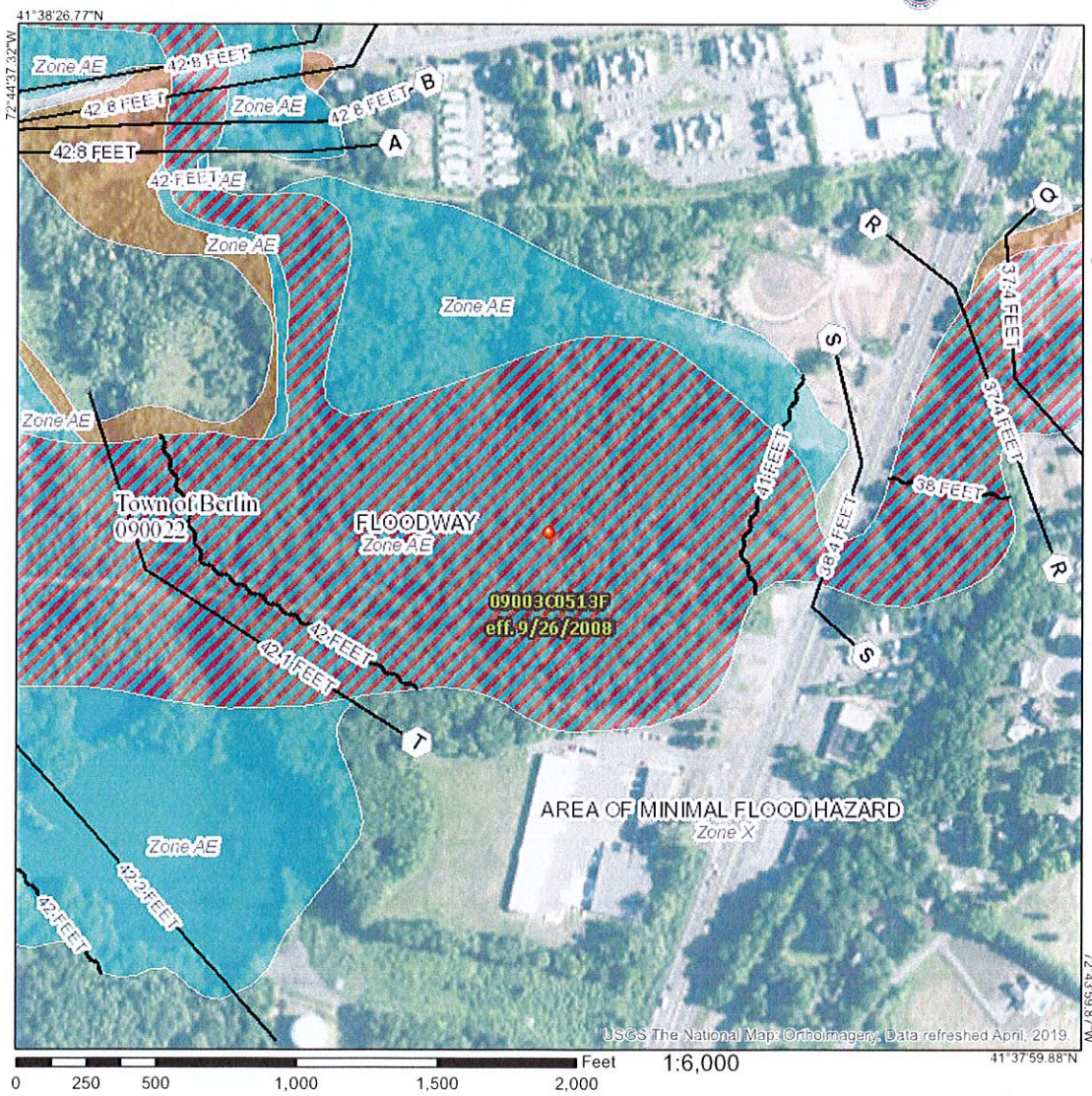
Sincerely,

WENGELL, McDONNELL & COSTELLO, INC.

Stephen R. McDonnell, P.E.

Cc: James Horbal, Deputy Director, Public Works

National Flood Hazard Layer FIRMette



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **3/25/2020 at 1:20:09 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

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Exhibit B

Study Limit Determination

When performing a hydraulic study, it is normally necessary to gather data both upstream of and downstream of the study reach. Gathering additional data upstream is necessary in order to evaluate any upstream impacts due to construction alternatives that are being evaluated within the study reach (Figure 3-1). The limits for data collection upstream should be at a distance such that the increase in water surface profile resulting from a channel modification converges with the existing conditions profile. Additional data collection downstream of the study reach is necessary in order to prevent any user-defined boundary condition from affecting the results within the study reach. In general, the water surface at the downstream boundary of a model is not normally known. The user must estimate this water surface for each profile to be computed. A common practice is to use Manning's equation and compute normal depth as the starting water surface. The actual water surface may be higher or lower than normal depth. The use of normal depth will introduce an error in the water surface profile at the boundary. In general, for subcritical flow, the error at the boundary will diminish as the computations proceed upstream. In order to prevent any computed errors within the study reach, the unknown boundary condition should be placed far enough downstream such that the computed profile will converge to a consistent answer by the time the computations reach the downstream limit of the study.

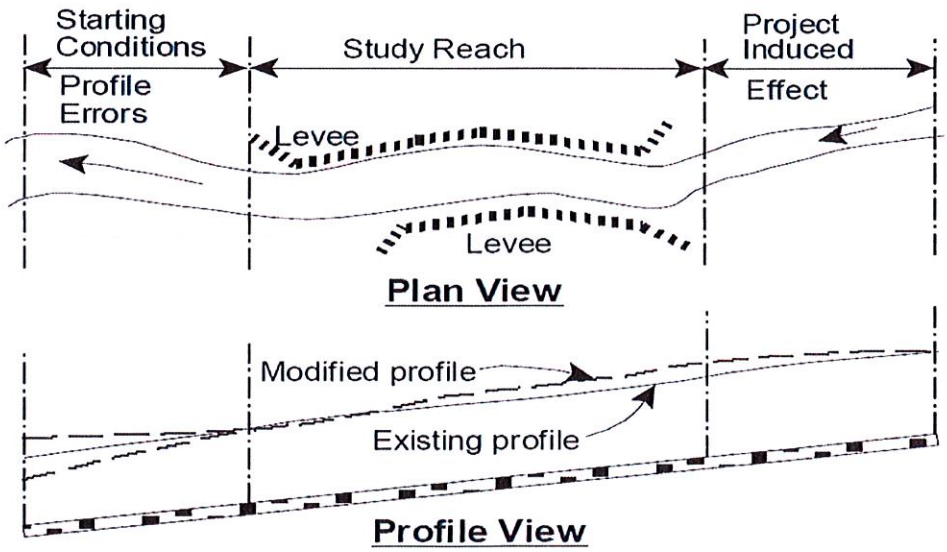

Figure 3-1 Example Study Limit Determination

EXHIBIT C

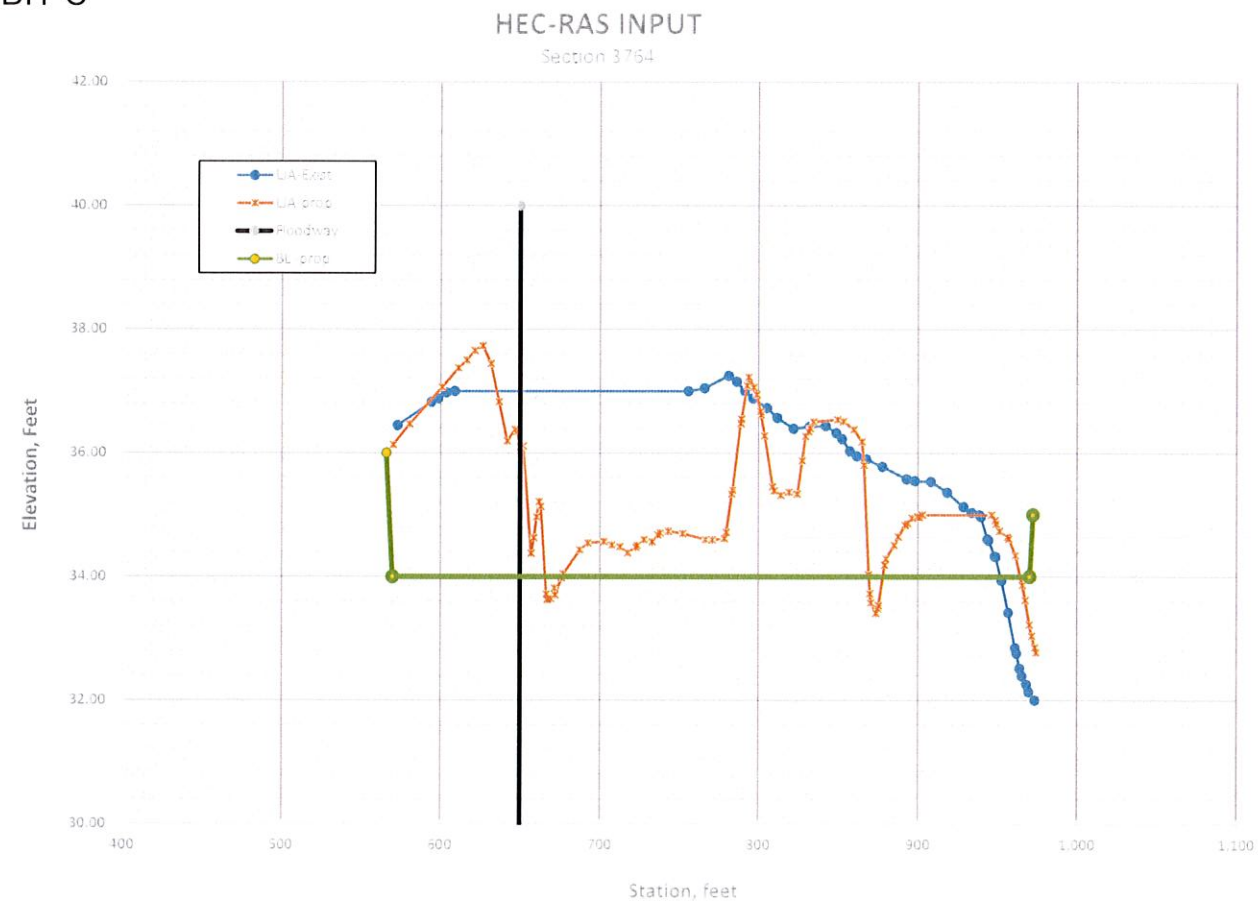
HEC-RAS INPUT
Section 3764
LOB Exist
LOB prop
Floodway
BL prop
42.00
40.00
38.00
36.00
34.00
32.00
30.00
Elevation, Feet
400
500
600
700
800
900
1,000
1,100
Station, feet

EXHIBIT D

Section 3764

Point	Existing		Proposed	
	Station	Elevation	Station	Elevation
1	0.000	49.866	0.000	50.306
2	5.543	49.561	6.989	49.939
3	10.700	49.227	14.280	49.512
4	14.796	48.991	22.214	49.026
5	19.871	48.617	27.289	48.655
6	24.946	48.189	32.364	48.227
7	30.021	47.884	37.439	47.873
8	35.803	47.541	51.916	47.098
9	40.171	47.279	53.191	47.041
10	44.449	47.053	57.739	47.000