Honeywell
301 Plainfield Road
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Syracuse, NY 13212
315-552-9700
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July 15, 2016

To: Harry Warner, NYSDEC, Region 7 (1 bound)
Diane Carlton, NYSDEC, Region 7 (1 PDF)
Holly Sammon, Onondaga County Public Library (1 bound)
Samuel Sage, Atlantic States Legal Foundation (1 bound)
Mary Ann Coogan, Camillus Town Hall (1 bound)
Stephen Weiter, Moon Library (1 bound)
Joseph J. Heath, Esq. (1 bound)
Melissa Lewandowski, Solvay Public Library (1 bound)

Re: Letter of Transmittal – Onondaga Lake Repository Addition

The below document has been approved by the New York State Department of Environmental Conservation (NYSDEC) and is enclosed for your document holdings:

- Onondaga Lake Capping, Dredging, Habitat and Profundal Zone (SMU 8) Final Design, Wastebed B/Harbor Brook Outboard Area Wetland Optimization Design Revision June 2016

Sincerely,

John P. McAuliffe

John P. McAuliffe, P.E.
Program Director, Syracuse

Enc.

cc: Timothy J. Larson, P.E., NYSDEC Project Manager
Chris Fitch, Brown and Sanford (ecopy)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Remediation, Remedial Bureau D
625 Broadway, 12th Floor, Albany, NY 12233-7013
P: (518) 402-9676 | F: (518) 402-9773
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June 24, 2016

Mr. John P. McAuliffe, P.E.
Program Director, Syracuse
Honeywell
301 Plainfield Road, Suite 330
Syracuse, NY 13212

Re: Onondaga Lake Capping, Dredging, Habitat and Profundal Zone (SMU 8) Final Design, Wastebed B/Harbor Brook Outboard Area Wetland Optimization Design Revision, Dated June 2016

Dear Mr. McAuliffe:

We have received and reviewed the above-referenced document, a copy of which was attached to Edward Glaza's June 24, 2016 email to my attention, and the revised version of the document appropriately addresses our previous comments. Therefore, the Onondaga Lake Capping, Dredging, Habitat and Profundal Zone (SMU 8) Final Design, Wastebed B/Harbor Brook Outboard Area Wetland Optimization Design Revision, dated June 2016, is hereby approved. Please see that copies of the approved document, including this approval letter, are sent to the distribution list selected for this site as well as the document repositories selected for this site.

Sincerely,

Timothy J. Larson, P.E.
Project Manager

ec: B. Israel, Esq, - Arnold & Porter
J. Davis - NYSDOL, Albany
M. Schuck - NYSDOH, Albany
M. McDonald – Honeywell
R. Nunes - USEPA, NYC
M. Sergott - NYSDOH, Albany
E. Glaza - Parsons

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July 14, 2016

Mr. Timothy J. Larson
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau D
625 Broadway, 12th Floor
Albany, NY 12233-7016

RE: Onondaga Lake Capping, Dredging, Habitat and Profundal Zone (SMU 8) Final Design, Wastebed B/Harbor Brook Outboard Area Wetland Optimization Design Revision June 2016

Dear Mr. Larson:

Enclosed you will find one bound copy and one electronic (PDF and original) of the Onondaga Lake Capping, Dredging, Habitat and Profundal Zone (SMU 8) Final Design, Wastebed B/Harbor Brook Outboard Area Wetland Optimization Design Revision, dated June 2016.

Please feel free to contact Ed Glaza at 315-451-9560 or me if you have any questions.

Sincerely,

John P. McAuliffe

John P. McAuliffe, P.E.
Program Director, Syracuse

Enclosure

cc: Robert Nunes, USEPA (1 bound, 1 PDF)
Argie Cirillo, USEPA (Cover letter only)
Mike Spera, AECOM (1 bound, 1 PDF)
Bob Montione, AECOM (1 bound, 1 PDF)
Tara Blum, NYSDEC (1 bound, 1 PDF)
Kenneth Lynch, NYSDEC (1 bound)
Margaret Sheen, Esq. NYSDEC (Cover Ltr Only)
Harry Warner, NYSDEC (1bound, 1 PDF)
Mark Sergott, NYSDOH (1 PDF)
Norman Spiegel, Env. Protection Bureau (Cover Ltr Only)
Andrew Gershon, Env. Protection Bureau (Cover Ltr Only)
John Davis, Env. Protection Bureau (1 bound, 1 PDF)
Joseph Heath, Esq. (ec Cover letter only)
Thane Joyal, Esq. (1 PDF)

cc: (Continued)

Curtis Waterman (1 PDF)
Alma Lowry, Esq. (1 PDF)
Jeanne Shenandoah, Onondaga Nation (1 bound Plus ec Cover letter only)
Bill Hague, Honeywell (ec Cover Ltr Only)
Brian Israel, Arnold & Porter (1 PDF)
Steve Miller, Parsons (1 PDF)
Edward Glaza, Parsons (1 bound)
Joe Detor, Anchor QEA (1 PDF)

ONONDAGA LAKE CAPPING, DREDGING, HABITAT AND PROFUNDAL ZONE (SMU 8) FINAL DESIGN

WASTEBED B/HARBOR BROOK OUTBOARD AREA WETLAND OPTIMIZATION DESIGN REVISION

Prepared for:

Honeywell

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Prepared by:

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June 2016

WASTEBED B/HARBOR BROOK OUTBOARD AREA WETLAND OPTIMIZATION DESIGN REVISION

SUMMARY OF DESIGN REVISION

This wetland optimization design revision pertains to various features that will be incorporated into the Wastebed B/Harbor Brook Outboard Area (Outboard Area) wetlands to increase the habitat diversity, increase the wetland's resilience to wind/wave action, and provide for cap surface elevations that will facilitate wetland vegetation establishment. These revisions do not impact the original cap design or protectiveness of the cap. These revisions will result in an increase in the cap thickness in some areas, and will provide additional protection against erosion by placing protective berms around portions of the wetland to aid in their establishment.

The habitat optimization components included in this design revision were developed in part based on the results from a 1.6-acre test planting area that was initiated in the western Outboard Area in 2014. Cap completion, including topsoil placement, and seeding and planting was completed in the test area consistent with the original design. As observed in subsequent monitoring, high water levels and shoreline wave energy resulted in erosion of the topsoil and loss of vegetation in the test area. The wetland optimization design will address the challenges identified during monitoring of the test planting area as well as provide additional habitat benefits. Specific revisions to the Final Design (Parsons and Anchor QEA, 2012a) are shown in Figures 1 through 3 and include:

- Berms to provide protection from wind/wave energy
- Plateaus at slightly higher elevations than the original design to provide improved conditions for establishment of wetland vegetation and reduce erosion potential in areas not directly behind the berms
- Incorporation of erosion resistant armored edges along the outer edges of the plateaus and along the barrier wall in areas not directly behind the berms to reduce erosion potential. The cobble armoring on the 5H:1V slope along the barrier wall and along the transition from a plateau area to the forested wetland will include topsoil in the interstitial spaces of the cobble and will be planted.
- Filling of hot spot dredge areas not located behind a berm to reduce shoreline slopes and provide increased cap elevations to provide improved conditions for establishment of wetland vegetation
- Changing the wetland plantings to predominantly floating aquatic species in the deeper areas behind the berms
- Modification of the plant selection to favor more robust species such as cattails and cordgrass that will provide greater resistance to wind/wave energy, and to species better able to tolerate periods of inundations such as cattail, rushes, and bulrushes (overall

species diversity and total quantity of plants will be increased slightly). Plantings will include species that retain standing structure through the winter to provide appropriate spawning locations for pike

The erosion of the topsoil habitat layer in the test planting area does not impact the design or conclusions regarding the protectiveness of the coarser erosion protection layer included in the cap design throughout the lake and Outboard Area. The cap design throughout the lake and Outboard Area includes an erosion protection layer which was designed to be protective taking into consideration potential erosional forces that would result from a 100-year storm. In near-shore areas, this layer consists of gravel or cobble, which underlies the finer-grained habitat layer which is subject to potential movement due to wave action. It was understood during the design process that there was a potential for the topsoil habitat layer to be subject to some erosion, but that use of topsoil was necessary in order to establish the beneficial wetland plantings in this area. The test planting area was completed to better understand the likelihood of erosion and allow development of an optimization plan, if appropriate based on the results, which is the basis for this Design Revision.

Cap thickness and elevation acceptance criteria and verification procedures will be consistent with the details provided in the Construction Quality Assurance/Quality Control Plan (Parsons and Anchor QEA, 2012b) and relevant subsequent field change forms. Details pertaining to the revised planting plan for these areas will be provided in the forthcoming Habitat Design Addendum.

BERMS

The revised design incorporates six berms (labeled A through F) along the widest portions of the Outboard Area to provide protection from wind/wave energy, as shown in Figure 1. Berms E and F have been designed with a gap between them to promote water exchange between the lake and the area behind the berm where Harbor Brook discharges. The ends of berms B, D, and E that are closest to the shoreline will be offset 10 feet from the base of the slope up to the barrier wall. A typical berm cross-section detail is shown in Figure 2.

The coarse cobble (type A) will have the following gradation:

U.S. Standard Sieve Size	Percent Passing (by weight)
12 inch	90
6 inch	50
3 inch	5

This coarse cobble material was selected based on consideration of erosion resistance, wave transmission, construction methods and tolerances, and availability of materials. This material is expected to withstand significant wave events that may occur in the lake. However, since this material is rounded with a wide gradation for habitat restoration purposes (a more natural material), and is slightly smaller than the required particle size predicted to be resistant to erosion in a 100-year storm, the berm face and crest may adjust over time in response to extreme wave and ice events that occur in the lake (similar to a natural shoreline). The surface voids in the coarse cobble will be filled with topsoil along the first 30 feet of all berms, as measured from the end closest to the barrier wall, to allow for seeding and planting, including live stakes.

The berm heights were developed to achieve an approximate top elevation of 365 feet North American Vertical Datum of 1988 (NAVD88) following approximately three years of settlement that will result due to the weight of the berm and underlying cap material. The settlement evaluation for the berms was performed consistent with the methods detailed in Appendix E of the Final Design Report for predicting settlement due to cap placement. This involved use of data collected from cores during the pre-design investigation and laboratory consolidation test results using both conventional odometer methods and the seepage-induced consolidation methods. Settlement predictions were based on consideration of underlying sediment properties, the amount of dredging prior to cap placement, the underlying cap design, the berm height, and the water depth in the area where the berm is located. Based on all of these considerations, the predicted settlement for Berms E and F is the greatest and therefore they have the highest target design elevation immediately following construction. Resulting design elevations for the top of the berms immediately following construction are listed below.

- Berm A: 365.9 feet
- Berm B: 365.5 feet
- Berm C: 365.4 feet
- Berm D: 365.3 feet
- Berms E and F: 366.0 feet

The berms will have minimal impact on the chemical isolation effectiveness of the cap. The minimum chemical isolation design life for the cap per the Final Design is 1,000 years. The cap design and granular activated carbon (GAC) application rates were developed considering upward flow of contaminated porewater due to advection as well as due to expression of underlying sediment porewater resulting from consolidation due to the weight of the overlying cap. The berms will increase the rate and total amount of settlement and consolidation. However, porewater expression due to consolidation is minor compared to advection over the full 1,000-year simulation period, ranging from 0.3% to 9% of the total upward flow based on the original modeling for the seven different cap model areas where a berm or berms will be included. Therefore, the increase in porewater expression due to consolidation in the small areas where berms will be constructed will have minimal impact on the 1,000-year design life for the cap. Any minor impacts would be more than offset by the GAC overdosing that occurred during cap placement. For example, GAC overdosing in the outboard area exceeded 40% in all cap model areas in the Outboard Area based on quality control measurements of the GAC within the placed cap material.

The berm alignments and heights also took into consideration potential stability limitations related to the berm weight, the range of lake water surface elevations, and underlying sediment properties; the geotechnical stability of the proposed berms listed above has been verified based on these factors. All of the berms will be located in areas where significant dredging occurred prior to cap placement, thus the soft surface sediments which could have significantly impacted stability are no longer present.

The berms will be located partially within the Outboard Area and partially within the lake. The area occupied by the berms within the Outboard Area is approximately 0.4 acres. The area occupied by the berms within the lake is approximately 1.2 acres. The area of the berms above a lake level of 362.5, which was used as the basis for the Final Design is approximately 0.6 acres.

Berm elevations of 365 feet will provide significant reduction in wave energy and provide protection for the wetlands in the areas behind the berms, as shown in Table 1. Berms with a top elevation approximately equal to the average lake surface elevation were also considered. Berms at this lower elevation would be similar in effectiveness to the shallow area incorporated into the design within the lake in the area adjacent to the Harbor Brook discharge. Although some reduction in wave energy would result, the benefits would be minimal when water levels are at higher elevations such as those that occur frequently throughout the year, as shown in Table 1.

The predicted wave energy reductions shown in Table 1 were developed based on site-specific information. Based on the orientation of the Lake, winds blowing from the northwest are expected to produce the largest wind-generated waves that impact the Outboard Area. The local wind climate was evaluated to determine representative wind conditions from the north and northwest directions. Wind speeds and direction data were retrieved from the National Climactic Data Center (NCDC) meteorological station at Hancock International Airport for the period of 1942 through January 2016. Using these data, a range of wave heights was computed for various wind speeds using two Onondaga Lake surface water levels:

- A lake surface level of 363.0 feet NAVD88
- A lake surface level of 364.0 feet NAVD88

A lake surface level of 363 feet represents the approximate average lake elevation during the growing season (which is 362.8). At higher lake levels, waves have the potential to travel further toward the shoreline before breaking and have the potential to impart more energy and erosive forces to the shoreline. A lake level of 364 feet was also evaluated, which is the approximate 95% lake elevation (i.e., this elevation is exceeded 18 days/year on average).

When waves travel through the nearshore areas of the Outboard Area and impact the proposed permeable berm structures, the wave energy is reduced and the height of the transmitted wave will be lower than the incident (incoming) wave. The transmission coefficient is the ratio of transmitted wave height to the incoming wave. The wave transmission was estimated using the methods outlined in the USACE's coastal engineering manual for low-crested breakwaters (USACE, 2006). The amount of transmitted wave energy is based on the berm crest height, water level, and proposed berm shape and configuration. The average transmission coefficient computed by each method was used to determine the wave height on the landward side of the berm structures. Table 1 shows the results of the analysis based on two berm crest elevations.

After the plants have had multiple years to establish (2 to 3 years), it is anticipated they will be less susceptible to damage from waves, and will provide increased erosion protection for the topsoil in the wetlands. Following successful completion of the multi-year Honeywell wetland monitoring and maintenance program, a determination will be made in conjunction with NYSDEC regarding whether the wetlands would be self-sustaining in the absence of the berms. Established wetlands in this area were stable prior to remediation. However, the wetlands present in this area prior to initiation of remediation and restoration were at elevations that were typically at least 1 foot higher than the currently planned wetlands and were dominated by the invasive species *Phragmites*, which are very erosion resistant, but provide very poor habitat value. If it is determined that the berms are no longer required, they will cut down to a lower elevation as determined appropriate. The berm material would be spread into the surrounding area outside of the berm alignment. In addition, an interim assessment of the effectiveness and need for the berms, including assessment of the amount of settlement, will be conducted following year two of the monitoring period.

PLATEAUS

Plateaus at an elevation of 363.3 feet will be incorporated into previously sloped areas not directly protected by berms. The cap surface in these areas as well as in the areas behind the berms originally consisted of a uniform slope from elevation 363.25 to 361.25 feet, as detailed in the Final Design. These elevations were slightly increased as documented in Capping Field Change Form 22 such that the cap slope ranged from 363.55 to 361.55 feet to account for higher average lake elevations during the growing season than was assumed in the Final Design (362.8 feet vs. 362.5 feet assumed in the Final Design). The creation of the plateaus will result in more appropriate elevations for establishment of emergent wetland vegetation and reduce the potential for erosion in these areas.

A protective edge consisting of coarse cobble will be incorporated into the lake-side edges of the plateaus to help prevent erosion of the outer edge of the topsoil plateau, as detailed in Figure 3. The coarse cobble (type B) will have the following gradation, which will be resistant to the erosive forces that may be encountered in a 100-year storm event:

U.S. Standard Sieve Size	Percent Passing (by weight)
9 inch	100
6 inch	50
3 inch	5

These edges, as well as the lake-side slopes of the filled hot spots discussed below, will be at a 5 horizontal: 1 vertical slope (5H:1V). More gradual slopes were considered to reduce the erosive energy on these slopes. However, maintaining a 5H:1V slope results in a shorter slope area which will minimize the area that will have a substrate consisting of coarse cobble rather than topsoil. The design revision also includes use of coarse cobble on the 5H:1V edge of the forested wetland plateau between berms B and C and on the short 5H:1V slope from the plateaus to the top of the barrier wall to minimize the potential for erosion along these slopes.

The plateaus will have minimal impact on the chemical isolation effectiveness of the cap. Consistent with the discussion above pertaining to berms, the minimum chemical isolation design life for the cap per the Final Design is 1,000 years, and the cap design and GAC application rates were developed considering upward flow of contaminated porewater due to advection as well as due to expression of underlying sediment porewater resulting from consolidation due to the weight of the overlying cap. Porewater expression due to consolidation is minor compared to advection, ranging from 0.2% to 0.3% of the total upward flow for the two cap model areas where a plateau will be included. Therefore, the increases in porewater expression due to consolidation in the areas where plateaus will be constructed will have minimal impact on the 1,000-year design life for the cap.

The plateau design took into consideration potential stability limitations related to the additional weigh of cap material required to build the plateaus, and the geotechnical stability of the proposed plateaus has been verified. All of the plateaus will be located in areas where significant dredging occurred prior to cap placement, thus the soft surface sediments which could have significantly impacted stability are no longer present.

The Final Design included a planted transition zone extending 25 feet into the lake from the outer edge of the Outboard Area that would include a surficial habitat layer consisting of a minimum of one foot of topsoil. The revised design retains this planted topsoil transition zone except in those areas where a berm is located within the transition zone.

HOT SPOT FILLING

The dredging plan for the Outboard Area included several areas where an additional 1 meter of sediment dredging was included for removal of hot spots. This resulted in cap surface elevations in these areas that were correspondingly 1 meter deeper than the adjacent areas. An additional one meter of fill will be added in the hot spot removal areas within the plateau areas and as needed to construct the berms (Hot spots OB2, OB3, and a portion of OB1) so that the final cap elevation in these areas is consistent with the adjacent areas. The filling of the hot spots will result in more appropriate elevations for establishment of wetland vegetation and reduce the potential for erosion in these areas. The original design included filling of Hot Spots OB4 and OB6 so no revision is necessary in these areas. Filling of OB5 is not necessary because it is behind a berm so will be protected from erosion. The planting plan will be revised to incorporate floating aquatic vegetation in the OB5 area which is appropriate for the water depths in this area.

ADDITIONAL EROSION CONTROL MEASURES

The implementation of the revised design will also include additional short-term measures to reduce the potential for erosion during the period when vegetation is being established. This will include:

- Use of erosion control fabrics in areas above average lake level
- Use of wire mesh enclosures designed to protect plants from being dislodged by fish and wildlife, and to protect them from floating debris. Additional material, intended to help dissipate wave energy, will be incorporated into some of the enclosures.
- Use of a cover crop to quickly establish root mass following topsoil placement

Details on these additional erosion control measures will be included in the forthcoming Habitat Design Addendum.

It is anticipated that earthen materials required to complete the cap and berms in the Outboard Area will be placed in mid to late 2016. As documented in the draft Habitat Design Addendum, wetland planting will occur during the first appropriate seasonal planting window following cap completion and approval in an area, which is anticipated to be 2017 based on the cap construction schedule in this area. To avoid high water levels typically experienced in spring while still providing an adequate summer growing period after installation, the goal will be to install most herbaceous plants between June 1 and July 31. To reduce the erosion potential during the period between topsoil placement and wetland vegetation planting, the area above the lake level will be seeded and covered with erosion control fabric shortly after topsoil placement is completed. This will include the new plateau areas and the upper portion of the gradually sloped areas that are above lake level behind the berms (Figure 4). The berms will also provide significant protection from wave-generated erosion prior to vegetation establishment. Vegetation remaining in the test area will be preserved to the extent practical during comprehensive restoration implementation in the Outboard Area.

MONITORING AND MAINTENANCE

A monitoring and maintenance program will be implemented beginning in the first growing season following restoration. The details of this program will be similar to other sites within the Onondaga Lake program and will be submitted to NYSDEC for approval as part of the Onondaga Lake Monitoring and Maintenance Scoping Document (OLMMS). This will include identification of response actions if goals pertaining to wetland reestablishment are not met. Potential response actions could, for example, include maintenance of the berms if they settle to a lower elevation than predicted and it is determined that resulting wave-induced erosion is contributing significantly to non-attainment of goals.

REFERENCES

USACE (U.S. Army Corps of Engineers), 2006. *Coastal Engineering Manual.* Engineering Manual EM 1110-2-1100, U.S. Army Corps of Engineers: Washington, D.C.

Parsons and Anchor QEA (Anchor QEA, LLC), 2012a. "*Onondaga Lake Capping, Dredging, Habitat and Profundal Zone (SMU 8) Final Design.*" Prepared for Honeywell. March 2012.

Parsons and Anchor QEA. 2012b. "*Construction Quality Assurance Plan Onondaga Lake Capping, Dredging and Habitat.*"

TABLE 1
BERM EFFECTIVENESS IN REDUCING WAVE HEIGHTS WITHIN THE OUTBOARD AREA

Design Case		Incident Significant Wave Height (Hs) (feet)	Transmitted Wave Height (Hs) (feet)
Crest Elevation = 363.0 ft	Water Level El. = 363.0 ft	1.0	0.4
		1.5	0.5
	Water Level El. = 364.0 ft	1.0	0.8
		1.5	1.0
		2.2	1.2
Crest Elevation = 365.0 ft	Water Level El. = 363.0 ft	1.0	0.0
		1.5	0.0
	Water Level El. = 364.0 ft	1.0	0.3
		1.5	0.4
		2.2	0.5

Notes:

- Elevation 363 is approximately equal to the average lake elevation of during the growing season of 362.8.
- Elevation 364 is approximately the 95% lake elevation (i.e. this elevation is exceeded 18 days/year on average).
- Wave heights of 1 foot are exceeded frequently in any given year.
- A wave height of 1.5 feet occurs on average approximately once per year.
- A wave height of 2.2 feet occurs on average approximately once every 5 years.

Figure 1 – Outboard Area Wetland Optimization Conceptual Plan

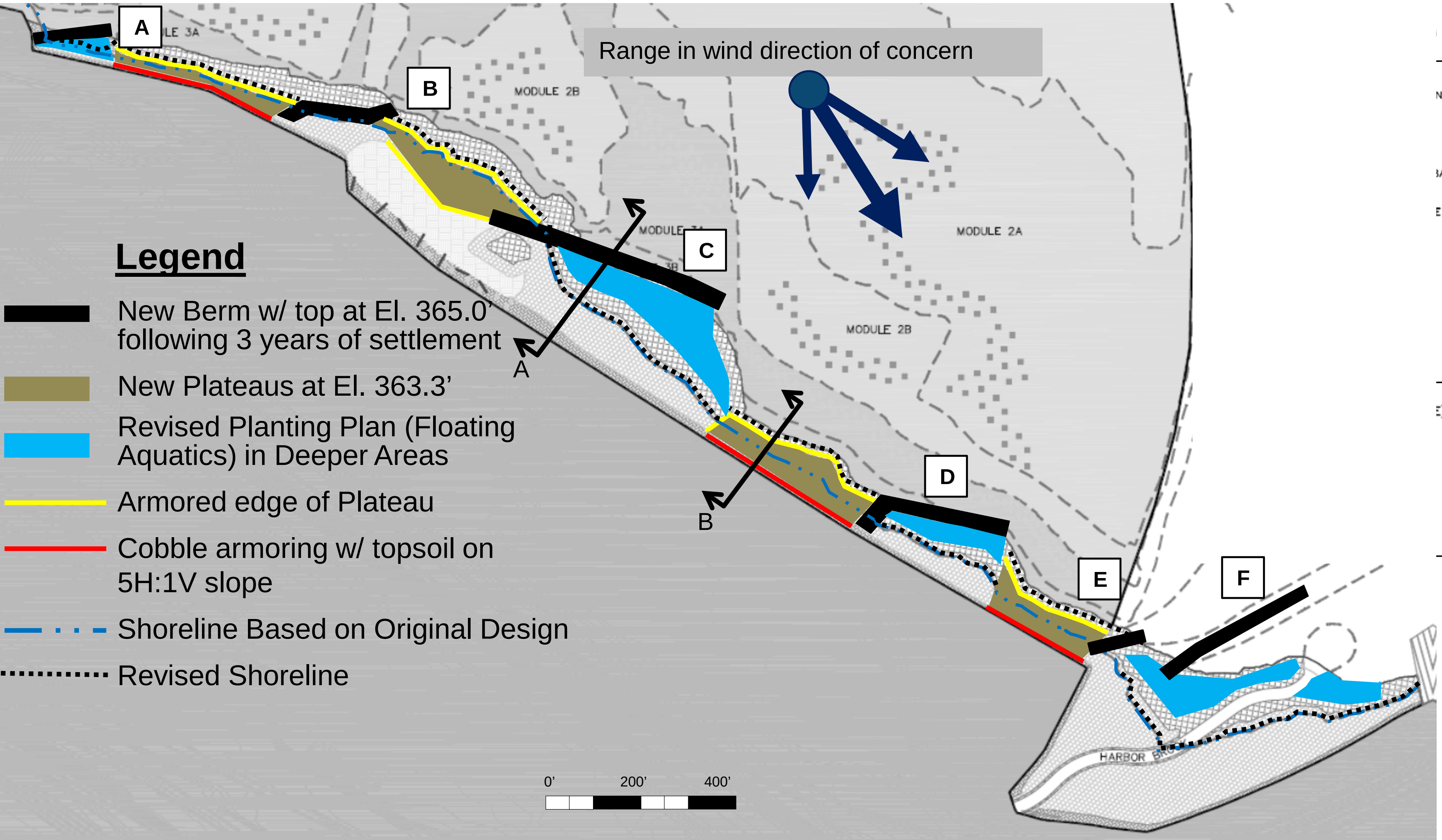

Figure 2 - Cross-Section A
Typical Bermed Area

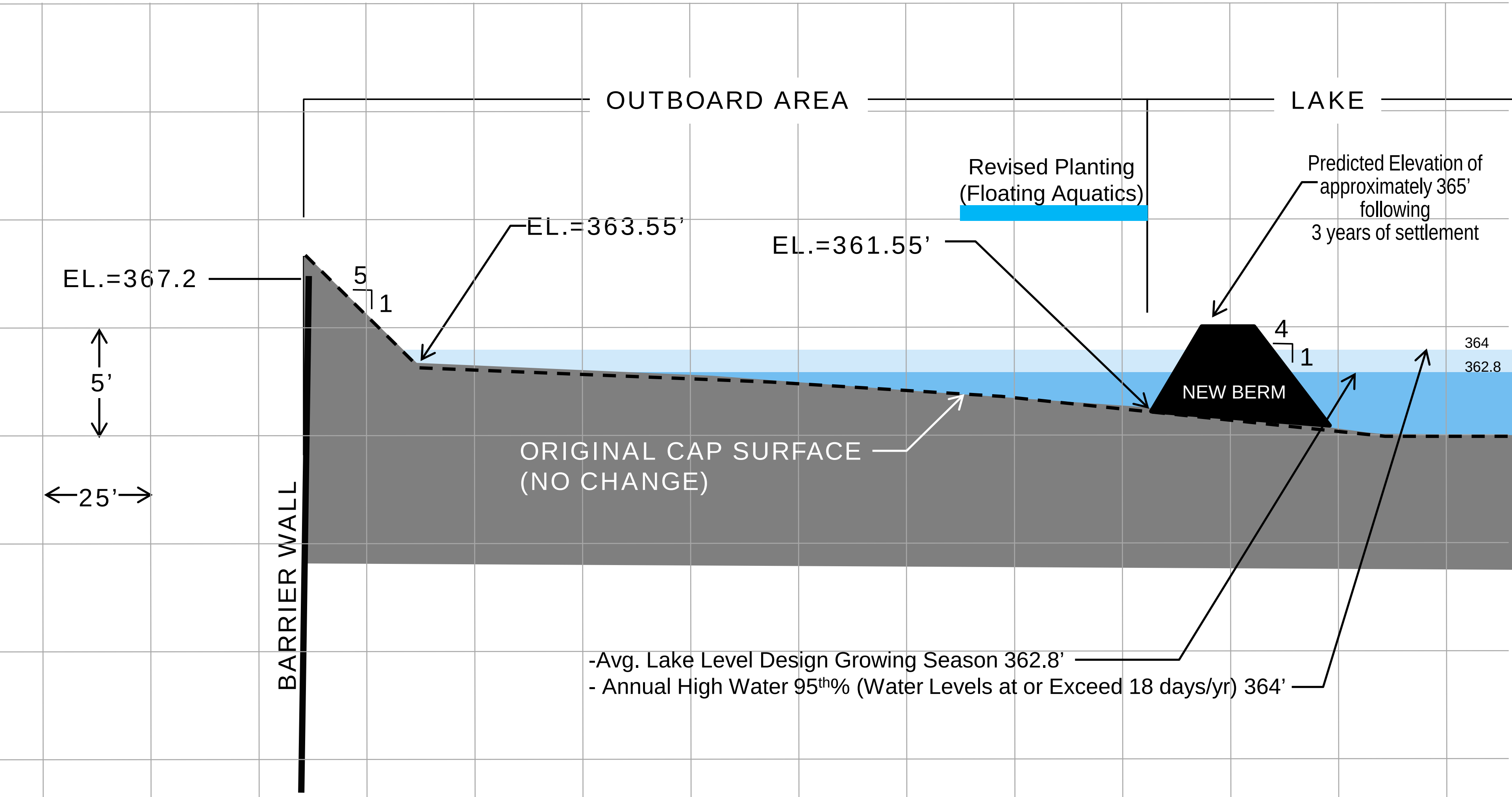

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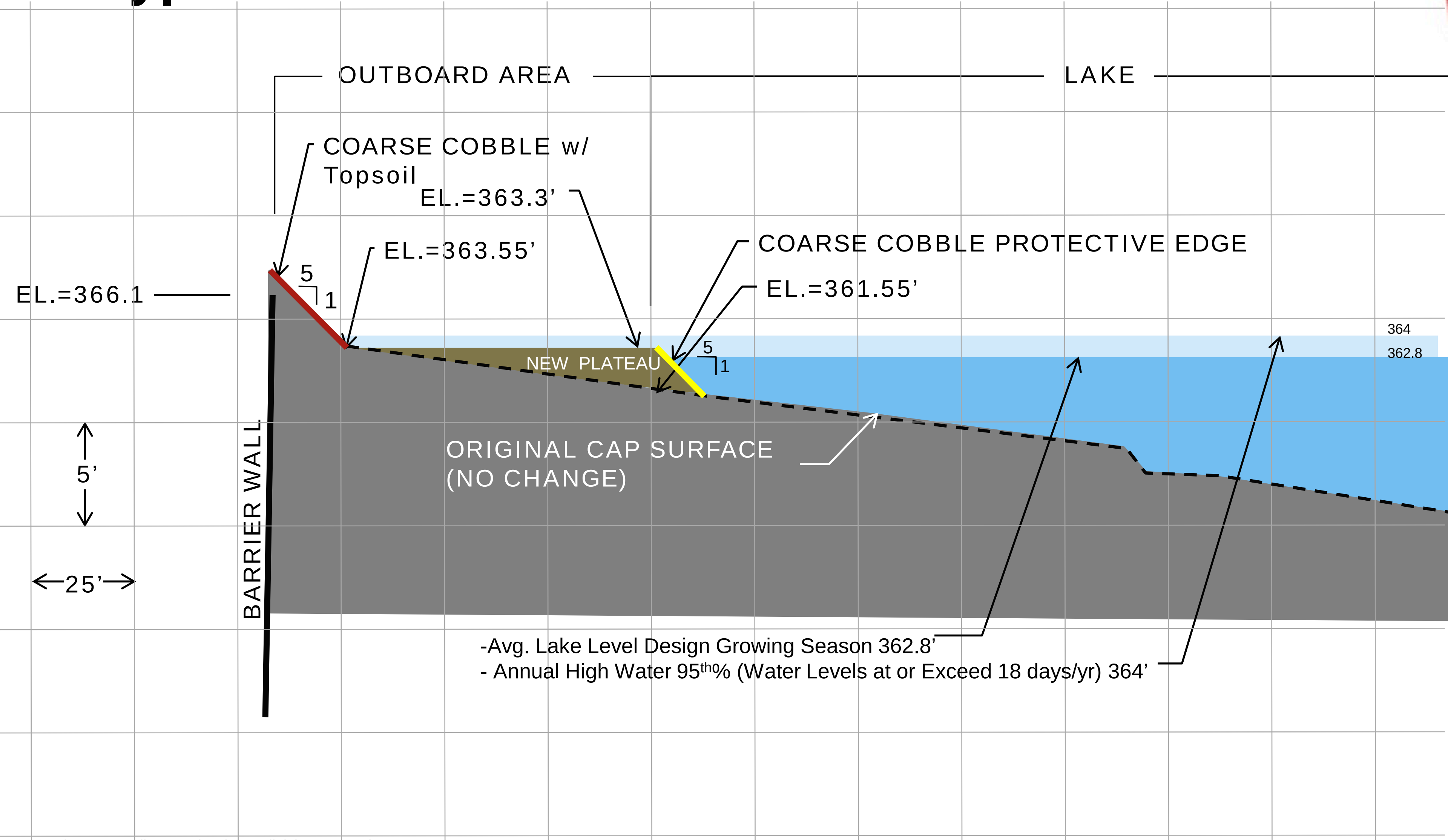
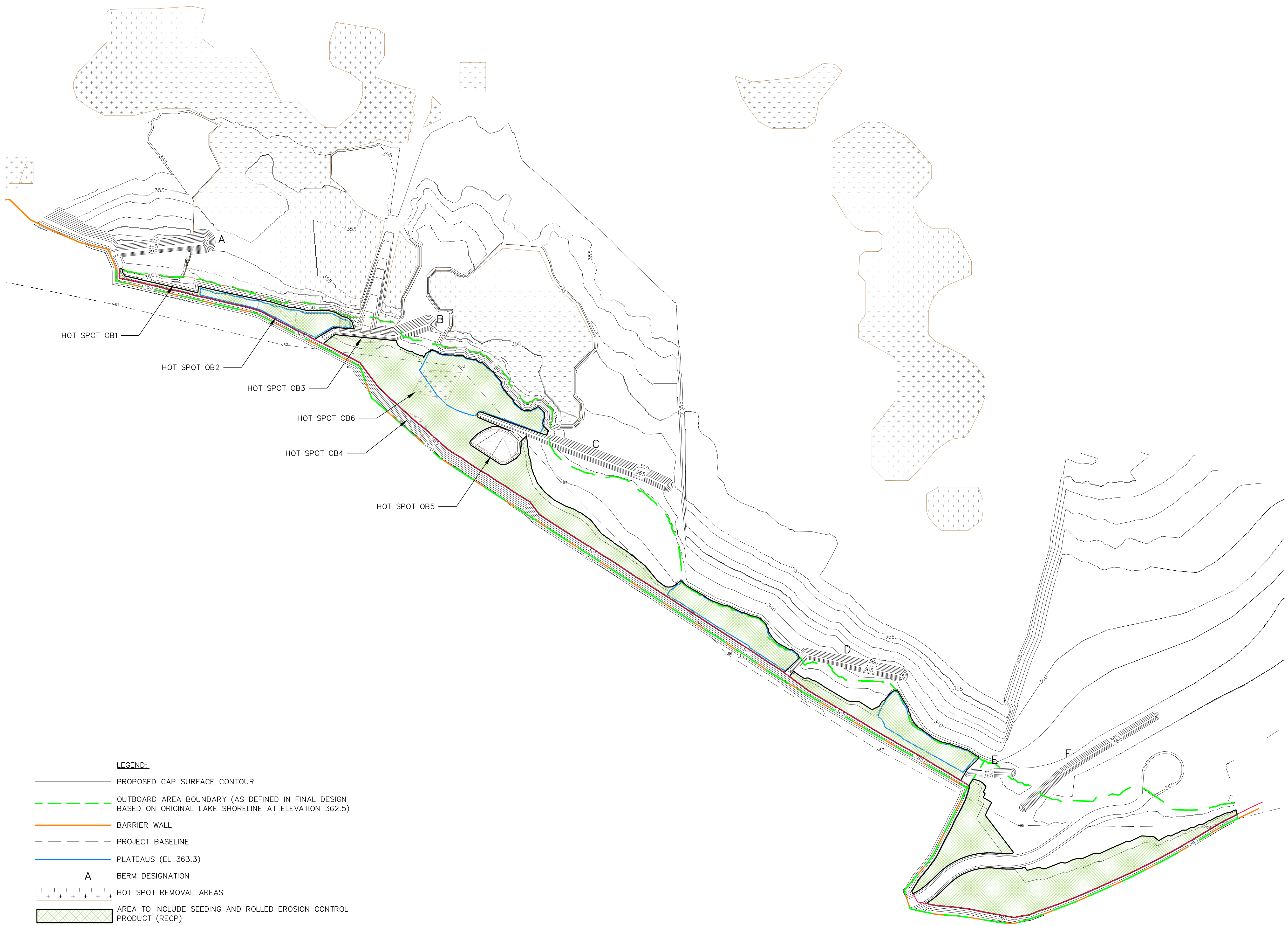
Figure 3 - Cross-Section B
Typical Plateau Area





LEGEND:

- PROPOSED CAP SURFACE CONTOUR
- OUTBOARD AREA BOUNDARY (AS DEFINED IN FINAL DESIGN BASED ON ORIGINAL LAKE SHORELINE AT ELEVATION 362.5)
- BARRIER WALL
- PROJECT BASELINE
- PLATEAUS (EL 363.3)
- A — BERM DESIGNATION
- HOT SPOT REMOVAL AREAS
- AREA TO INCLUDE SEEDING AND ROLLED EROSION CONTROL PRODUCT (RECP)

SCALE: 1"=150'
(150 0 150 300)

DRAWING IS HALF-SIZE IF PLOTTED 11x17

NO.	DESCRIPTION	DATE	DRAWN	CHK'D	APPV'D
0	ISSUED FOR CONSTRUCTION	6/23/16	JR	JCN	ECG

DRAWN BY JR	DATE 4/14/16	SEAL
CHECKED BY JCN	DATE 6/23/16	
APPROVED BY ECG	DATE 6/23/16	
PROJECT MGR. THA	DATE 6/23/16	

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PROJECT TITLE
Honeywell
ONONDAGA LAKE
OUTBOARD AREA
SYRACUSE, NEW YORK

DRAWING TITLE
WASTEBED B/HARBOR BROOK
OUTBOARD AREA
WETLAND OPTIMIZATION DESIGN
PLAN VIEW WITH SEEDING AND RECP AREA

SCALE AS SHOWN

DRAWING NO. FIGURE 4 REV. 0

FILE NAME: P:\HONEYWELL -SYR\449422 - CAPPING 2015\10 TECHNICAL\10.1 CAD\HABITAT FIGURES-2015\BERM INFO\DESIGN\FROM ANCHOR\RAD-OUTBOARD-SEEDING.DWG
PLOT DATE: 6/24/2016 3:57 PM PLOTTED BY: RUSSO, JILL