

STORMWATER MANAGEMENT REPORT

for



**Block 330, Lots 2-6, 24-29
Atlantic City, Atlantic County, New Jersey**

December 2025

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1.0 PROJECT DESCRIPTION

1829 Arctc Ave RE LLC (Applicant) is seeking land use approvals for the construction of a Wendy's fast-food restaurant at the intersection of Arctic Avenue and Ohio Avenue in Atlantic City, Atlantic County, New Jersey. The project includes construction of a new building, driveways, utilities, stormwater management facilities, landscaping and lighting.

The subject property is currently two single family dwellings. The project will be developed as permitted by the CRDA Tourism District Land Development Rules for the Central Business District, (CBD zone), the NJ Coastal Zone Management Rules, NJ Flood Hazard Area Control Act Rules, NJ Stormwater Management Rules, NJ Soil Erosion and Sediment Control Standards and Atlantic County Land Development Standards, as applicable.

The surrounding land uses are as follows:

1. To the east – vacant lots along Arctic Avenue;
2. To the south– parking lot across Arctic Avenue;
3. To the west – retail use across Ohio Avenue; and
4. To the north – business use across Garfield Avenue (alley).

Topographic elevations at the site (referenced to the North American Vertical Datum of 1988) range from 8.0 in the eastern area of the site to 6.5 in the western area of the site. The site drains in an westerly direction overland to an underground stormwater collection system in Ohio Avenue. Runoff flowing from the site travels directly to the Absecon Inlet then to the Atlantic Ocean (NJDEP Watershed Management Area 15 – Great Egg Harbor).

The site is located in a tidal flood hazard area associated with the Atlantic Ocean. Although the Federal Emergency Management Agency (FEMA) has not officially adopted preliminary mapping released in 2015 for the purpose of flood insurance, the preliminary maps for the area are the regulatory standard for use in permit applications and demonstration of compliance with building codes as it is considered the “best available” flood hazard data. The site is located in Zone A8 with a base flood elevation of 10 as shown on FEMA Flood Insurance Rate Map (FIRM) panel number 3452780005D revised August 15, 1983.

According to the USDA Natural Resources Conservation Service (NRCS) New Jersey Soil Survey web data, the soil types on the project site are:

Psammaquents sulfidic substratum (PstAt) sand, 0 – 2% slopes, classified as Hydrologic Soil Group A.

2.0 DESIGN CRITERIA

The stormwater management analysis and design is in accordance with the Stormwater Management Rules at N.J.A.C. 7:8, subchapters 5 and 6, the New Jersey Stormwater Best Management Practices Manual, the New Jersey Residential Site Improvement Standards, and the New Jersey Soil Erosion and Sediment Control Standards.

In accordance with the New Jersey Department of Environmental Protection (NJDEP) Stormwater Management Rules at N.J.A.C. 7:8, the development of the project is classified as a "Major Development." A Major Development is defined therein as a development which ultimately disturbs one or more acres of land and/or increases impervious coverage and/or regulated motor vehicle surface by one-quarter of an acre or more. The project disturbs less than one acre and increase impervious and motor vehicle surface less than 0.25 acres. The three technical requirements of the Stormwater Management Rules at N.J.A.C 7:8 that generally need to be addressed are groundwater recharge, runoff quantity and runoff quality, and those requirements need to be addressed using Green Infrastructure (GI) as outlined in section 5.3 of the rules.

- Groundwater Recharge Standard – N.J.A.C. 7:8-5.4(b)1 sets forth the minimum design and performance standards for groundwater recharge where suitable soils exist. The design engineer, using the assumptions and factors for stormwater runoff and groundwater recharge calculations at N.J.A.C. 7:8-5.7, shall either:
 - i. Demonstrate through hydrologic and hydraulic analysis that the site and its stormwater management measures maintain 100 percent of the average annual preconstruction groundwater recharge volume for the site; or
 - ii. Demonstrate through hydrologic and hydraulic analysis that the increase of stormwater runoff volume from pre-developed to post-developed for the projected two-year storm, as defined and determined pursuant to N.J.A.C. 7:8-5.7(d) is infiltrated.

NJAC 7:8-5.4(b)2. specifies that the groundwater recharge of (b)1 does not apply to projects within the "urban redevelopment area." NJAC 7:8-1.2 defines "urban redevelopment area" as previously developed portions of areas delineated on the State Plan Policy Map (SPPM) as the Metropolitan Planning Area (PA1), designated centers, cores or nodes.

- Runoff Quantity Control Standard - N.J.A.C. 7:8-5.6(b) requires that in order to control stormwater runoff quantity impacts, the design engineer shall, using the assumptions and factors for stormwater runoff calculations at N.J.A.C. 7:8-5.7, complete one of the following:

1. Demonstrate through hydrologic and hydraulic analysis that for stormwater leaving the site, post-construction runoff hydrographs for the current and projected 2-year, 10-year and 100-year storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events; or
 2. Demonstrate through hydrologic and hydraulic analysis that there is no increase, as compared to the pre-construction condition, in the peak runoff rates of stormwater leaving the site for the current and projected 2-year, 10-year and 100-year storm events and that the increased volume or change in timing of stormwater runoff will not increase flood damage at or downstream of the site. This analysis shall include the analysis of impacts of existing land uses and projected land uses assuming full development under existing zoning and land use ordinances in the drainage area; or
 3. Design stormwater management measures so that the post-construction peak runoff rates for the current and projected 2-year, 10-year and 100-year storm events are 50, 75 and 80 percent, respectively, of the pre-construction peak runoff rates. The percentages apply only to the post-construction stormwater runoff that is attributable to the portion of the site on which the proposed development or project is to be constructed.
 4. In tidal flood hazard areas, stormwater runoff quantity analysis, in accordance with (b)1, 2 and 3 above is required unless the design engineer demonstrates through hydrologic and hydraulic analysis that the increased volume, change in timing, or increased rate of the stormwater runoff, or any combination of the three will not result in additional flood damage below the point of discharge of the major development. No analysis is required if the stormwater is discharged directly into any ocean, bay, inlet or the reach of any water course between its confluence with an ocean, bay, or inlet and downstream of the first water control structure.
- Runoff Quality Standard – N.J.A.C. 7:8-5.5(b) requires the stormwater management measures be designed to reduce the post-developed load of total suspended solids (TSS) in stormwater runoff generated from the water quality design storm by 80 percent of the anticipated load, expressed as an annual average, shall be achieved for the stormwater runoff from the net increase of motor vehicle surface. The water quality design storm is 1.25 inches of rainfall in two hours. Water quality calculations shall take into account the distribution of rain from the water quality design storm. The calculation of the volume of runoff may take into account the implementation of non-structural and structural stormwater management measures.

3.0 TECHNIQUES OF ANALYSIS

In accordance with the stormwater runoff calculation methodology at N.J.A.C. 7:8-5.7, the quantity (volume and rate) of stormwater runoff is calculated based on the USDA NRCS methodology using the NRCS Runoff Equation and Dimensionless Unit Hydrograph, as described in Technical Release 55 - Urban Hydrology for Small Watersheds (TR-55), dated June 1986. A unit peak discharge factor of 285 is applied to the dimensionless unit hydrograph for runoff estimation on lands that are located within the coastal zones of New Jersey rather than the standard factor of 484. This is known as the Delmarva unit hydrograph and applies to this site as described in NJDEP Bulletin No. NJ-210-3-1; being in the coastal plain region with slopes less than 5%, low relief and storage areas in depressions. The Delmarva unit hydrograph will predict a lower peak discharge than that of the standard hydrograph, but the volume of stormwater runoff will not be affected by the factor change. The rainfall distribution used in the calculation is NOAA-C as described in NJDEP Bulletin NJ-210-12-1.

Rainfall depths used for the various calculations are as outlined in NJAC 7:8-5.7(c) and (d) for current and future/projected rainfall depths using NOAA 24 hour Type C distributions and site specific rainfall depths available from the NOAA Atlas 14 rainfall values and adjustment factors described in Tables 5-5 and 5-6 of NJAC 7:8 updated through July 17, 2023. The various Times of Concentration (T_c) were determined for pre and post-developed conditions using the hydraulically longest flow path. The T_c flow path can be found on the Drainage Area Plans located in Appendix I. The pre and post-developed T_c calculations can be found in Appendices A through D.

Curve numbers (CN) were generated for the drainage areas for pre and post-developed conditions based on the soil group and existing or proposed land use. The CN calculations can be found in Appendices A through D for the respective routings. Note that impervious areas were calculated as separate subareas to generate hydrographs without weighted CNs as outlined in the BMP manual chapter 5.

Using the drainage areas, the TCs and CNs as input data, version 10.20-5a of *HydroCAD*, a hydrologic/hydraulic software program by HydroCad Software Solutions, LLC, was employed to generate runoff volumes and rates.

4.0 LAND COVER CONDITIONS

For the purpose of comparison of pre and post development conditions, the site is broken into three distinct drainage areas based on where they discharge to the areas surrounding the site. The majority of the site drains to the west to the existing underground stormwater pipe system at intersection of Ohio Avenue and Arctic Avenue, Design Point A. There is a portion of the site on the northwestern side that drains westerly to the adjacent property, Design Point B. The northern area of the site drains in a northerly direction the existing alley, Garfield Avenue, Design Point C. There is no pipe system in this road, so the runoff flows along the pavement. The tables below summarize the pre-existing and post developed cover conditions of the drainage areas, called Existing Drainage Areas 1, 2 & 3 and Proposed Drainage

Areas 1-9.

The subject property is currently mostly vacant with two existing single family homes as shown on the Drainage Area Plans in Appendix I and summarized below:

Table 4.1: Pre-Developed Cover Conditions

Drainage Shed Name	Drainage Shed Area (AC)	Impervious Surfaces (AC)	Open Space (AC)	Wooded (AC)
Existing Drainage Area 1 (EXDA-1)	0.31	0.12	0.19	0
Existing Drainage Area 2 (EXDA-2)	0.06	0.02	0.04	0
Existing Drainage Area 3 (EXDA-3)	0.29	0.08	0.19	0
Total Drainage Area	0.66	0.22	0.42	0

Table 4.2: Post-Developed Cover Conditions

Drainage Shed Name	Drainage Shed Area (AC)	Impervious Surfaces (AC)	Open Space (AC)	Wooded (AC)
Proposed Drainage Area 1 (PRDA-1)	0.07	0.06	0.01	0
Proposed Drainage Area 2 (PRDA-2)	0.08	0.07	0.01	0
Proposed Drainage Area 3 (PRDA-3)	0.17	0.16	0.01	0
Proposed Drainage Area 4 (PRDA-4)	0.07	0.07	0.00	0
Proposed Drainage Area 5 (PRDA-5)	0.06	0.00	0.05	0
Proposed Drainage Area 6 (PRDA-6)	0.05	0.05	0.00	0
Proposed Drainage Area 7 (PRDA-7)	0.04	0.00	0.04	0
Proposed Drainage Area 8 (PRDA-8)	0.02	0.00	0.02	0
Proposed Drainage Area 9 (PRDA-9)	0.10	0.00	0.10	0
Total Drainage Area	0.66	0.42	0.24	0

5.0 STORMWATER MANAGEMENT FACILITIES

The new stormwater management (SWM) facility proposed for the project is designed to satisfy the Runoff Control Quantity Standard at N.J.A.C. 7:8-5.6(b)3, and the Runoff Quality Standard at N.J.A.C. 7:8-5.5. The system includes four pervious pavement systems with subsurface infiltration. There are two underground pipe and stone systems for infiltration and detention. The proposed stormwater facilities are located within the project site and will be owned and maintained by the Applicant/Owner. The stormwater management facilities will be constructed in accordance with current NJDEP standards including adequate separation to the estimated seasonal high-water table.

According to Chapters 9.4 and 9.6 of the BMP Manual, the lowest elevation in a pervious pavement system and an infiltration basin must be at least two (2) feet above the seasonal high groundwater table. Soil test pits were advanced at multiple locations within the project site, the results for which are included in Appendix H.

Depths to the seasonally high groundwater table at each of the test pit locations were measured and at least two feet of separation to the seasonal high water table is provided in the design.

Table 5.1: Estimated Seasonally High Water Elevation

Basin #	Profile Pit #	Surface Elevation (ft)	Depth to SHGW (ft)	SHGW Elevation (ft)	Basin Bottom Elevation (ft)	Separation to SHW (ft)	Perm. Rate (in/hr)
PP-4	SPP-1	7.1	6.0	1.1	3.20	2.10	3.81
PP-4	SPP-2	6.5	6.0	0.5	3.20	2.70	4.93
Basin 5	SPP-3	7.5	8.0	-0.5	1.70	2.20	3.71
Basin 5	SPP-4	7.7	8.0	-0.30	1.70	2.00	8.42
Basin 6	SPP-4	7.7	8.0	-0.30	2.50	2.80	8.42
Basin 6	SPP-5	7.5	8.0	-0.50	2.50	3.00	7.19
PP-3	SPP-4	7.7	8.0	-0.30	1.92	2.22	8.42
PP-3	SPP-5	7.5	8.0	-0.50	1.92	2.42	7.19
PP-3	SPP-6	6.3	7.0	-0.70	1.92	2.62	2.98
PP-1	SPP-9	7.0	8.0	-1.0	1.97	2.97	5.75
PP-2	SPP-9	7.0	8.0	-1.0	2.67	3.67	5.75
PP-2	SPP-10	7.0	8.0	-1.0	2.67	3.67	6.39

The pervious pavement systems and infiltration underground basins are designed to infiltrate the Water Quality Design Storm volume and reduce flows from design storm events greater than the water quality storm using a combination of weirs at various elevations in an outlet control structure that is part of the subsurface infiltration basin. An outlet structure is provided for inspection purposes and not for flow.

The runoff from the regulated motor vehicle surface of the driveway and parking areas will be pretreated by the pervious asphalt in the parking areas prior to infiltration within the subsurface infiltration beneath the pervious pavement area.

Pervious pavement and subsurface basin cross-section details showing depth to seasonal high water and elevations during the Water Quality, 2-year, 10-year, 100-year storms are included in the overall project plan set and Appendix I.

6.0 INFILTRATION, GROUNDWATER RECHARGE & GROUNDWATER MOUNDING

Based on the tested permeability rates of the soil on site and the total potential stored depth of runoff in the basin below the lowest outlet, the basin will drain in less than 72 hours. Infiltration calculations are included in Appendix F.

NJAC 7:8-5.4(b)2. specifies that the groundwater recharge of (b)1 does not apply to projects within the "urban redevelopment area." NJAC 7:8-1.2 defines "urban redevelopment area" as previously developed portions of areas delineated on the State Plan Policy Map (SPPM) as the Metropolitan Planning Area (PA1), designated centers, cores or nodes.

Groundwater mounding associated with the system was evaluated and it was determined that the mound will not break the surface of the basin bottom or potentially impact any adjacent structures. That analysis is included in Appendix F.

The groundwater mounding analysis of the proposed stormwater management infiltration basins uses the computer model developed by the United States Geological Survey (USGS) in their Scientific Investigation Report (SIR) 2010-5102 and Chapter 13 of the NJDEP BMP Manual for Groundwater Table Hydraulic Impact Assessments for Infiltration BMPs. Both the report and the BMP Manual utilize the Hantush equation for simulation of ground water mounding.

7.0 RUNOFF QUANTITY

The stormwater management basins are designed to improve the amount of runoff discharging from the site generated by the required storm events. In accordance with N.J.A.C. 7:8-5.6, the post-development peak runoff rates for the current and projected 2-yr, 10-yr, and 100-yr storm events shall not exceed 50%, 75%, and 80%, respectively, of the pre-development peak runoff rates for the area where improvement is proposed.

Pursuant to N.J.A.C. 7:8-5.7(c), the precipitation depths for the current 2-yr, 10-yr and 100-yr storm events shall be determined by multiplying the values obtained from the NOAA Atlas 14 Point Precipitation Frequency Estimates by Table 5-5 Current Precipitation Adjustment Factors (N.J.A.C. 7:8-5.7(c)(2)). Pursuant to N.J.A.C. 7:8-5.7(d), the precipitation depths for the future 2-yr, 10-yr and 100-yr storm events shall be determined by multiplying the values obtained from the NOAA Atlas 14 Point Precipitation Frequency Estimates by Table 5-6, Future Precipitation Adjustment Factors (N.J.A.C. 7:8-5.7(d)). Table 7.1 below provides the precipitation and current and future factors.

Table 7.1: Precipitation Factors

Design Storm (year)	NOAA Rainfall (in.)	Current Precipitation Adjustment Factor	Current Precipitation (in.)	Future Precipitation Adjustment Factor	Future Precipitation (in.)
2	3.31	1.01	3.34	1.22	4.04
10	5.16	1.02	5.26	1.24	6.40
100	8.90	1.03	9.17	1.39	12.37

For the calculation of existing runoff the site was modeled as separate subareas based on proposed disturbance limits and land cover. The Existing Drainage Area Plan (Appendix H) defines the subareas and Appendices A & B contain the Pre-Developed Runoff Calculations. The calculation of the post-development site runoff was performed in the same manner as the pre-developed with the site broken up into different drainage subareas based on the type of land cover and the proposed disturbance limits. The same existing drainage pattern was maintained with no additional direct discharge offsite. The Proposed Drainage Area Plan (Appendix H) defines the subareas and Appendices C & D contain the Post-Development Runoff Calculations. Tables 7.2 & 7.3. below shows the reduction of current and projected pre and post-developed peak runoff rates for the Design Point A. Tables 7.4 & 7.5. below shows the reduction of current and projected pre and post-developed peak runoff rates for the Design Point B. Tables 7.6 & 7.7. below shows the reduction of current and projected pre and post-developed peak runoff rates for the Design Point C.

Table 7.2: Current Runoff Peak Reduction to Point A

Design Storm (year)	24-hour Rainfall Depth (in.)	Pre-developed Total Peak Runoff (cfs)	Allowable Peak Runoff ¹		Post-Developed Peak Runoff (cfs)
			(%)	(cfs)	
2	3.34	0.14	50	0.07	0.07
10	5.26	0.27	75	0.20	0.17
100	9.17	0.73	80	0.58	0.55

Table 7.3: Future Runoff Peak Reduction to Point A

Design Storm (year)	24-hour Rainfall Depth (in.)	Pre-developed Total Peak Runoff (cfs)	Allowable Peak Runoff ¹		Post-Developed Peak Runoff
			(%)	(cfs)	(cfs)
2	4.04	0.19	50	0.10	0.10
10	6.40	0.39	75	0.29	0.26
100	12.37	1.29	80	1.03	0.93

Table 7.4: Current Runoff Peak Reduction to Point B

Design Storm (year)	24-hour Rainfall Depth (in.)	Pre-developed Total Peak Runoff (cfs)	Allowable Peak Runoff ¹		Post-Developed Peak Runoff
			(%)	(cfs)	(cfs)
2	3.34	0.05	50	0.03	0.00
10	5.26	0.08	75	0.06	0.00
100	9.17	0.17	80	0.14	0.02

Table 7.5: Future Runoff Peak Reduction to Point B

Design Storm (year)	24-hour Rainfall Depth (in.)	Pre-developed Total Peak Runoff (cfs)	Allowable Peak Runoff ¹		Post-Developed Peak Runoff
			(%)	(cfs)	(cfs)
2	4.04	0.06	50	0.03	0.00
10	6.40	0.11	75	0.08	0.00
100	12.37	0.29	80	0.23	0.05

Table 7.6: Current Runoff Peak Reduction to Point C

Design Storm (year)	24-hour Rainfall Depth (in.)	Pre-developed Total Peak Runoff (cfs)	Allowable Peak Runoff ¹		Post-Developed Peak Runoff
			(%)	(cfs)	(cfs)
2	3.34	0.25	50	0.13	0.00
10	5.26	0.46	75	0.35	0.01
100	9.17	0.96	80	0.77	0.11

Table 7.7: Future Runoff Peak Reduction to Point C

Design Storm (year)	24-hour Rainfall Depth (in.)	Pre-developed Total Peak Runoff (cfs)	Allowable Peak Runoff ¹		Post-Developed Peak Runoff
			(%)	(cfs)	(cfs)
2	4.04	0.32	50	0.16	0.00
10	6.40	0.59	75	0.44	0.02
100	12.37	1.49	80	1.19	0.27

As shown in the tables above and the calculations in Appendices C & D, the rate of flow for runoff leaving the site is extremely low and the system provides a reduction in flow rates required by the regulations for both the current and projected/future rainfall conditions. This project will have a positive impact to downstream areas by reduction to potential flooding conditions from rain events.

8.0 RUNOFF QUALITY

In accordance with NJAC 7:8-5.2 and 5.5(a), a land development that creates 0.25 acres or more of new or additional impervious surface must include stormwater management measures that reduce the average annual total suspended solids (TSS) load in the post-construction runoff from the new impervious surface by 80%. Comparing the sum of the coverage conditions from Tables 4.1 and 4.2, the development results in an increase in impervious surface greater than 0.25 acres so the Runoff Quality Standard at NJAC 7:8-5.5 is applicable.

The subsurface infiltration basin is designed to infiltrate the water quality storm volume produced by the project site. In accordance with Chapter 4 of the BMP Manual, infiltration structures are given a TSS removal rate of 80%. The calculations for the Water Quality Storm in Appendix C show that the entire volume of runoff is retained for infiltration in the basin. Since the volume of runoff retained in the basins is equal to the runoff generated by the WQ storm, the water quality requirement of the applicable regulations is met.

Pretreatment of runoff to the subsurface infiltration basin is provided for the various impervious areas draining to it. Roof drains will be connected directly to the subsurface infiltration basin with the ends of the roof drain leaders wrapped in filter fabric. The remaining regulated motor vehicle surface will drain to the pervious asphalt that will pretreat runoff prior to infiltration within the subsurface infiltration beneath the pervious pavement area.

9.0 GREEN INFRASTRUCTURE AND LOW IMPACT TECHNIQUES

Green Infrastructure (GI) is intended to be an objective approach to addressing low impact stormwater management requirements and is generally a methodology to accomplish the quantitative requirements for water quality and groundwater recharge by spreading out the required infiltration volume in smaller stormwater management features around the site rather than one large downstream structure. The GI measures are described in detail in Chapter 9 of the BMP manual.

This project addresses GI requirements by providing pervious pavement and a subsurface infiltration feature with a small upstream drainage area and spreads water quality treatment and infiltration of runoff throughout the site to mimic existing conditions. The maximum ratio of additional inflow contributory drainage area to surface area to the pervious paving system is 3:1, pursuant to NJAC 7:8-5.3(b). The drainage area to each pervious pavement system does not exceed a ratio of 3:1, meeting design requirements. The discharge is controlled via an outlet structure to ensure infiltration of the water quality storm volume and to stage and attenuate the rates of runoff leaving the site for larger storm events. The soil encountered on site is generally conducive to infiltration and areas of soil that may restrict infiltration of runoff are proposed for replacement. This development meets the goals and requirements of GI by utilizing a large shallow infiltration feature throughout the site to meet the regulatory standards while still providing the expected site improvements for this type of development such as paved driveways.

10.0 SOIL EROSION AND SEDIMENT CONTROL

The proposed development proposed to use temporary soil erosion and sediment control measures during construction in accordance with the NJ Soil Erosion and Sediment Control standards.

11.0 OFFSITE STABILITY

Offsite stability is provided through the reduction in the discharge flow rates from the 2- and 10-year storm events as outlined in the New Jersey Soil Erosion and Sediment Control Standards Chapter 21.

12.0 CONCLUSION

As described above, the entire Stormwater Management System and its components are designed in accordance with applicable state and local municipal regulations and requirements utilizing Green Infrastructure. The subsurface infiltration basins are designed to accommodate the required design storms and provide runoff quantity reduction and water quality treatment as outlined in the State Stormwater Rules at N.J.A.C. 7:8 while providing an environmentally responsible and economically feasible system.

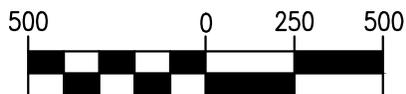
FIGURES

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SOURCE: OFFICIAL ZONING MAP OF ATLANTIC CITY

GRAPHIC SCALE



1 INCH = 500 FEET

Y&C 001.01

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NJ CERTIFICATE OF AUTHORIZATION NO. 24GA28290700

FIGURE 3 SOILS MAP
WENDY'S

ATLANTIC CITY, ATLANTIC COUNTY, NEW JERSEY

DATE:	9/24/2025	SCALE:	1"=500'	DRAWN BY:	BAS
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