

Project Information

Hope Farm

Farmhouse

Revision	Date
01	21 September 2026

Location:
Hope Farm,
The Haven,
Billingshurst,
RH14 9BN

Model Coordinates:
Latitude: 51.059344
Longitude: -0.474808

Software:
DIALux Evo: v14.0

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Overview

This report has been produced to discharge Condition 6 of the consented planning application reference DC/22/2377 which requires a lighting design scheme for biodiversity to be submitted for approval by the LPA.

This report provides a concise overview of the external lighting calculations for works to the Farmhouse at Hope Farm. It summarises the anticipated lighting performance of the proposed landscape lighting scheme. It incorporates manufacturer photometric data (IES/LDT files) for the proposed luminaires to provide a representative assessment of light distribution across the site.

The report presents selected Isolux Contours plots and tabulated illuminance values, clearly indicating the anticipated lighting levels and the extent of light spill associated with the proposed scheme.

The calculations support the wider project documentation and provide the design team with a straightforward reference for reviewing the proposed external lighting strategy.

Methodology

Calculations in the report to be read in conjunction with the Lighting Specification and associated landscape drawings prepared by the Landscape Architect.

The lighting calculations quantify the proposed design through Isolux Contours plots and tabulated illuminance values, illustrating the anticipated distribution of light and the extent of light trespass beyond the intended illuminated areas.

To provide an overview, the model has been configured to represent a worst-case lighting scenario. The following assumptions have been applied:

- A maintenance factor of 1.0 has been used, representing the initial maximum calculated light output without allowance for lumen depreciation over time.
- Surface reflectance values have been increased to account for a higher level of secondary reflected light.
- Wall-mounted luminaires have been modelled at their maximum bulb output, without applying reductions associated with glass casings and shades.
- Architectural shading, vegetation and other physical obstructions have not been relied upon to limit outward light distribution from luminaires.

These assumptions intentionally provide a conservative representation of the potential lighting impact. Under installed conditions, actual illuminance and light spill are expected to be equal to or lower than the calculated values due to material properties, luminaire construction, vegetation, mounting conditions and surrounding physical obstructions.

The analysis areas shown are graphical subdivisions used solely to present the calculation results at a legible scale and do not represent environmental lighting classifications.

Ecological Lighting Constraints

The assessment has been undertaken with reference to the Bat Flightline and Dark Corridor Plans for Lighting Design Proposals prepared by Collington Winter Environmental Ltd, dated 4 June 2025. The ecological assessment identifies established bat roost locations, areas of elevated bat activity and retained dark commuting and foraging corridors around the development. The lighting calculations therefore consider light spill towards these identified sensitive receptors, with particular attention to the northern access route, eastern landscape boundary and southern/eastern areas associated with the principal bat commuting corridors.

Proposed external lighting within or adjacent to these areas has been designed to minimise unnecessary illumination through low luminous outputs, warm colour temperatures, controlled downward distribution, shielding and appropriate operational controls. Relevant ecological constraints and dark corridors are illustrated on the ecological compliance plan contained within this report.

Lighting Controls

To further minimise unnecessary illumination and protect the identified ecological receptors, the proposed external lighting shall incorporate a controlled operational strategy in accordance with the project ecologist's recommendations.

Where applicable, luminaires within or adjacent to sensitive areas shall be operated via PIR/motion detection with short-duration activation, generally limited to approximately 1 minute, so that lighting is only provided when required for access, safety or security.

Lighting shall not operate continuously throughout the night unless specifically required, and unnecessary periods of illumination shall be avoided. This operational approach complements the use of low-output, warm-colour, predominantly downward-directed luminaires and provides an additional mitigation measure beyond the conservative worst-case illuminance calculations presented within this report.

Guidance

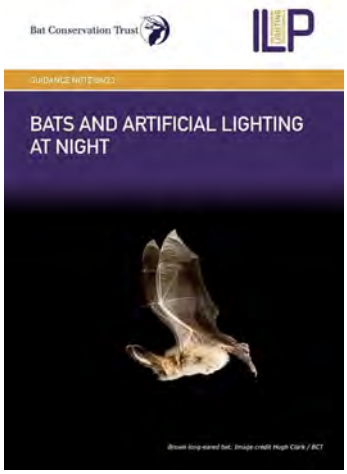
Publications

Institute of Lighting Professionals (ILP) / Bat Conservation Trust (BCT) Guidance Note 08/23

The ILP/BCT Guidance Note 08/23, *Bats and Artificial Lighting at Night*, provides current UK best-practice guidance for assessing and mitigating the effects of artificial light at night on bats. The guidance establishes a mitigation hierarchy based on avoiding unnecessary lighting, minimising the extent and duration of illumination, controlling light spill, and selecting appropriate spectral characteristics where lighting is required. The Hope Farm lighting strategy has been developed with regard to these principles and the ecological recommendations established for the wider site. Particular consideration has been given to limiting unnecessary illumination towards retained vegetation, identified bat commuting and foraging areas, and other ecologically sensitive landscape features.

- ➔ Sensitive Areas and Dark Corridors: The lighting design has been reviewed with reference to the bat flightline and dark-corridor recommendations prepared for Hope Farm. Light spill towards these areas has therefore been considered through luminaire positioning, controlled distributions, low-output fittings and the operational control strategy. The calculation drawings should be read alongside the relevant ecological information when assessing the relationship between proposed lighting and identified sensitive receptors.
- ➔ Contour Plans: The report includes isolux contour plans, point illuminance values and false-colour illuminance plots to demonstrate the anticipated extent and distribution of artificial light across the Farmhouse assessment area. These provide the quantitative evidence required to assess potential light spill towards surrounding landscape features.
- ➔ Lighting Controls: Where luminaires are located within or adjacent to ecologically sensitive areas, operation shall be limited through PIR/motion detection and short-duration activation, generally approximately one minute, in accordance with the project ecologist's recommendations. Continuous overnight operation shall be avoided unless specifically required for safety or security.
- ➔ Spectral and Luminaire Design: Any luminaires located within or directly influencing ecologically sensitive areas should be maintained at the agreed warm-white colour temperature and installed with appropriate shielding, orientation and aiming to minimise outward light spill.

Figure 1.0 - ILP/BCT Guidance Note 08/23



Zone	Surrounding	Lighting environment	Examples
E0	Protected	Dark (SQM 20.5+)	Astronomical Observable dark skies, UNESCO starlight reserves, IDA dark sky places
E1	Natural	Dark (SQM 20 to 20.5)	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, IDA buffer zones etc.
E2	Rural	Low district brightness (SQM ~15 to 20)	Sparsely inhabited rural areas, village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Well inhabited rural and urban settlements, small town centres of suburban locations
E4	Urban	High district brightness	Town / City centres with high levels of night-time activity

Calculation Overview

Ecological Lighting Compliance

All Areas



⟷	Indicative routes / areas of elevated bat activity identified within the ecological assessment
▭	Area containing luminaires subject to PIR/motion-control strategy

No proposed wall-mounted luminaire is located within 5 m of a known roost identified by the project ecologist. Hedgerow and treeline features along the access driveway and southern garden areas – supporting multiple species, including common pipistrelle, serotine, soprano pipistrelle and brown long-eared bat.

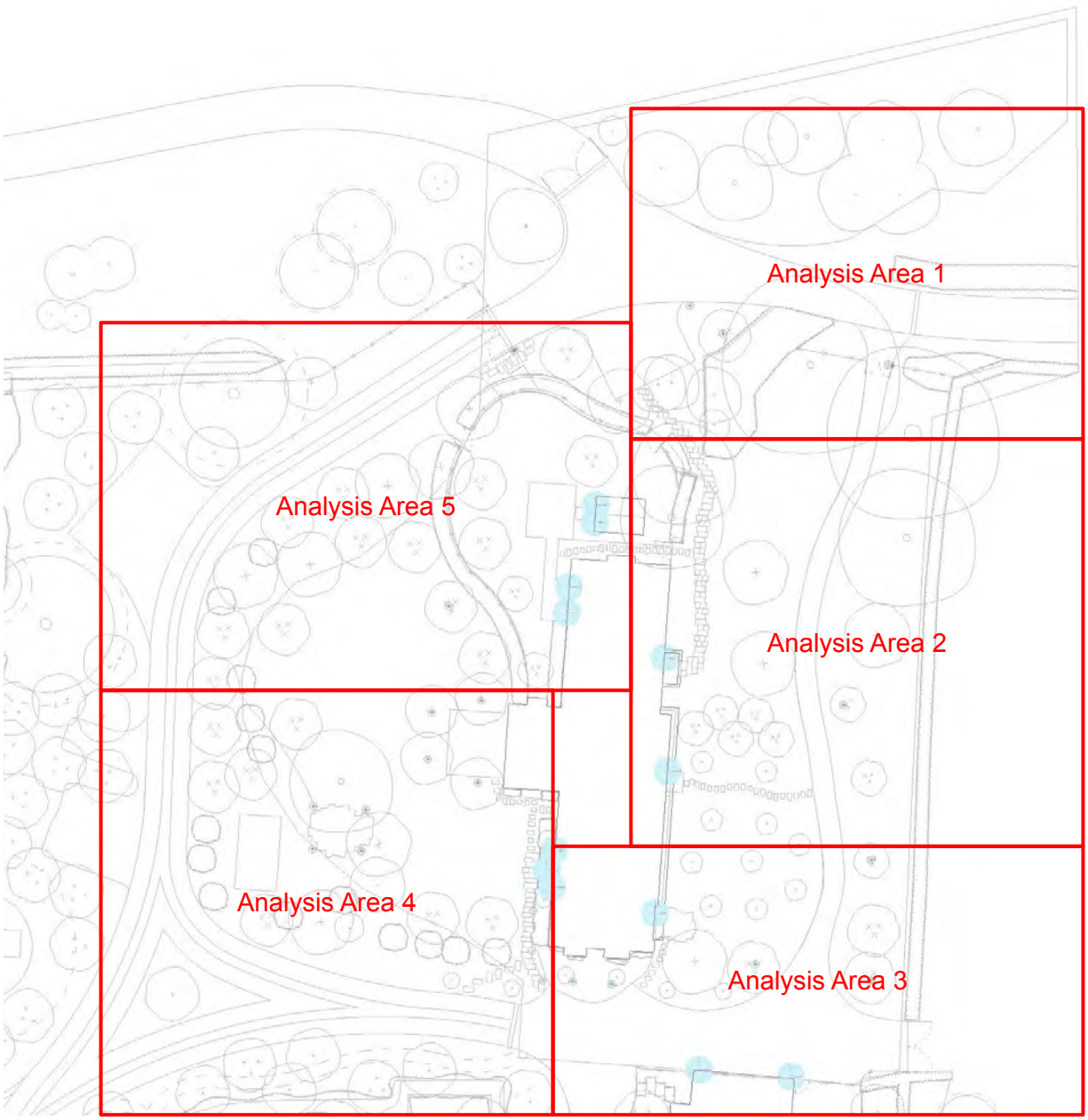
These receptors are highly sensitive to artificial light intrusion and have therefore been prioritised within the lighting design. The strategy seeks to maintain illuminance below 1.0 lux across identified sensitive routes where practicable, with light levels reduced towards zero within retained dark areas. Compliance should be read in conjunction with the associated isolux and false-colour calculation plots.

Figure 2.1 - Analysis Areas - Lighting Controls and Routes

Calculation Overview

Analysis Areas

All Areas - Luminaire Locations



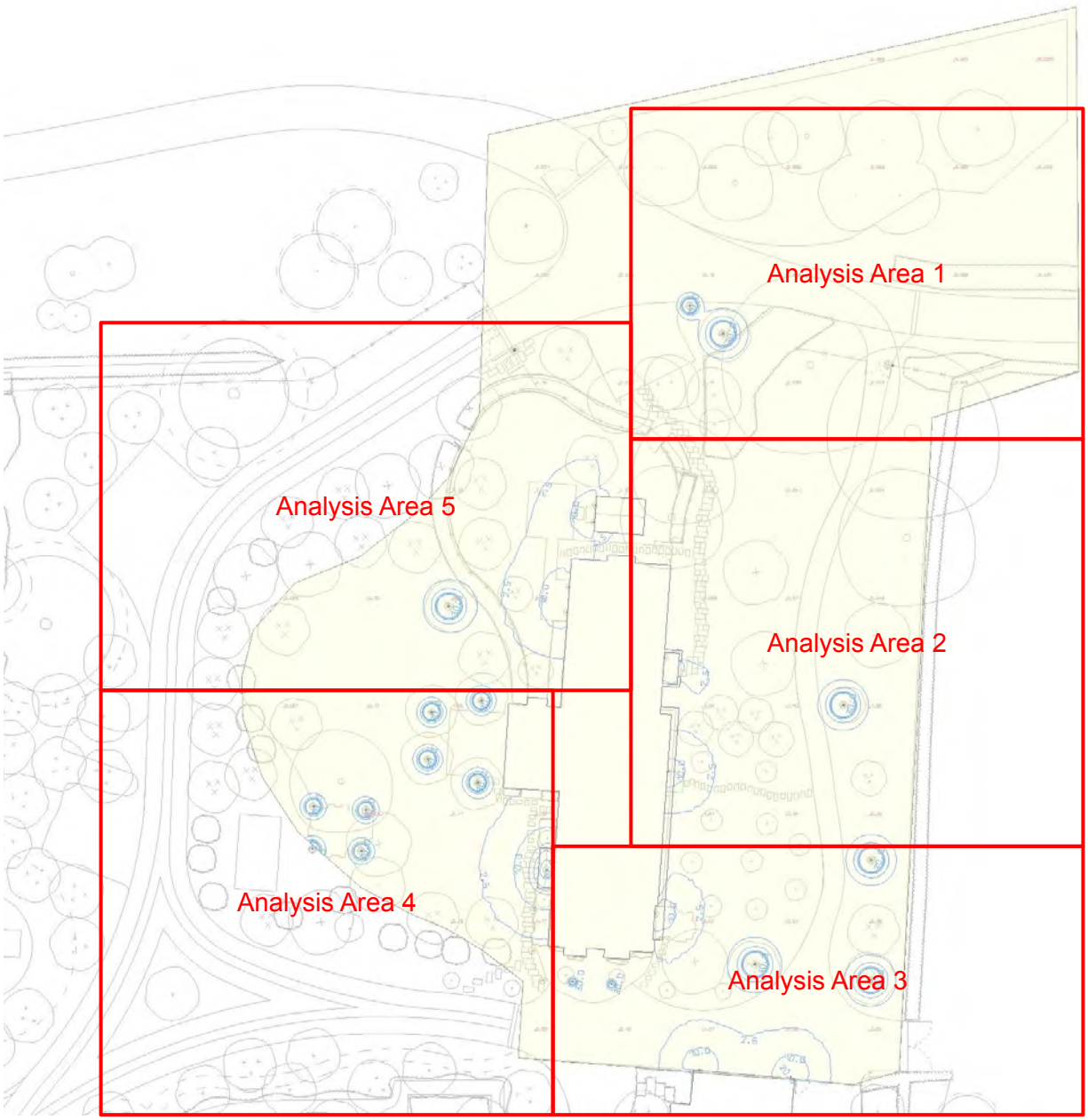
- ➔ Analysis Areas 1–5 are graphical subdivisions of the overall calculation model and are provided solely to present the lighting results at a legible scale.
- ➔ They do not represent separate environmental classifications or illuminance compliance targets.
- ➔ Where applicable, luminaires within these areas are subject to the PIR/motion-control strategy described within this report.

Figure 3.1 - Analysis Areas - Plan View

Calculation Overview

Isolux Contours and Value Charts Key

All Areas



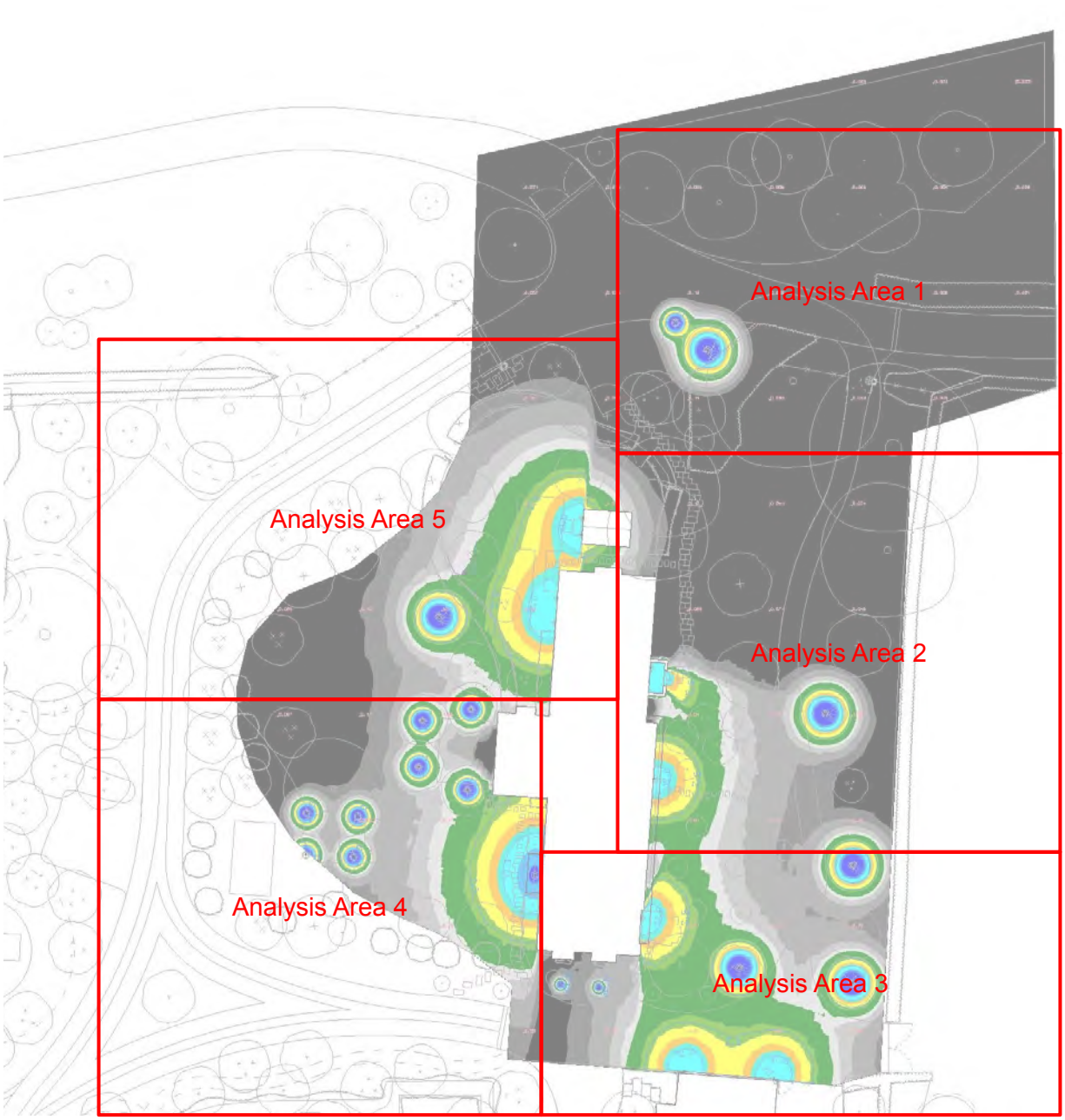
Value Chart Key	Point illuminance values: lx
Isolux Contours Key	Isolux Contours values: lx

Figure 3.2 - Isolux Contours Analysis Areas - Plan View

Calculation Overview

False-Colour Key

All Areas



False-Colour Illuminance Plot Configuration													
Lux Level Indicator													
0.10	0.20	0.30	0.50	0.75	1.00	2.00	3.00	5.00	7.50	10.00	20.00	30.00	lx

Figure 3.3 - False-Colour Illuminance Analysis Areas - Plan View

Analysis Area 1 Viewport

Luminaire Locations

Model Viewport

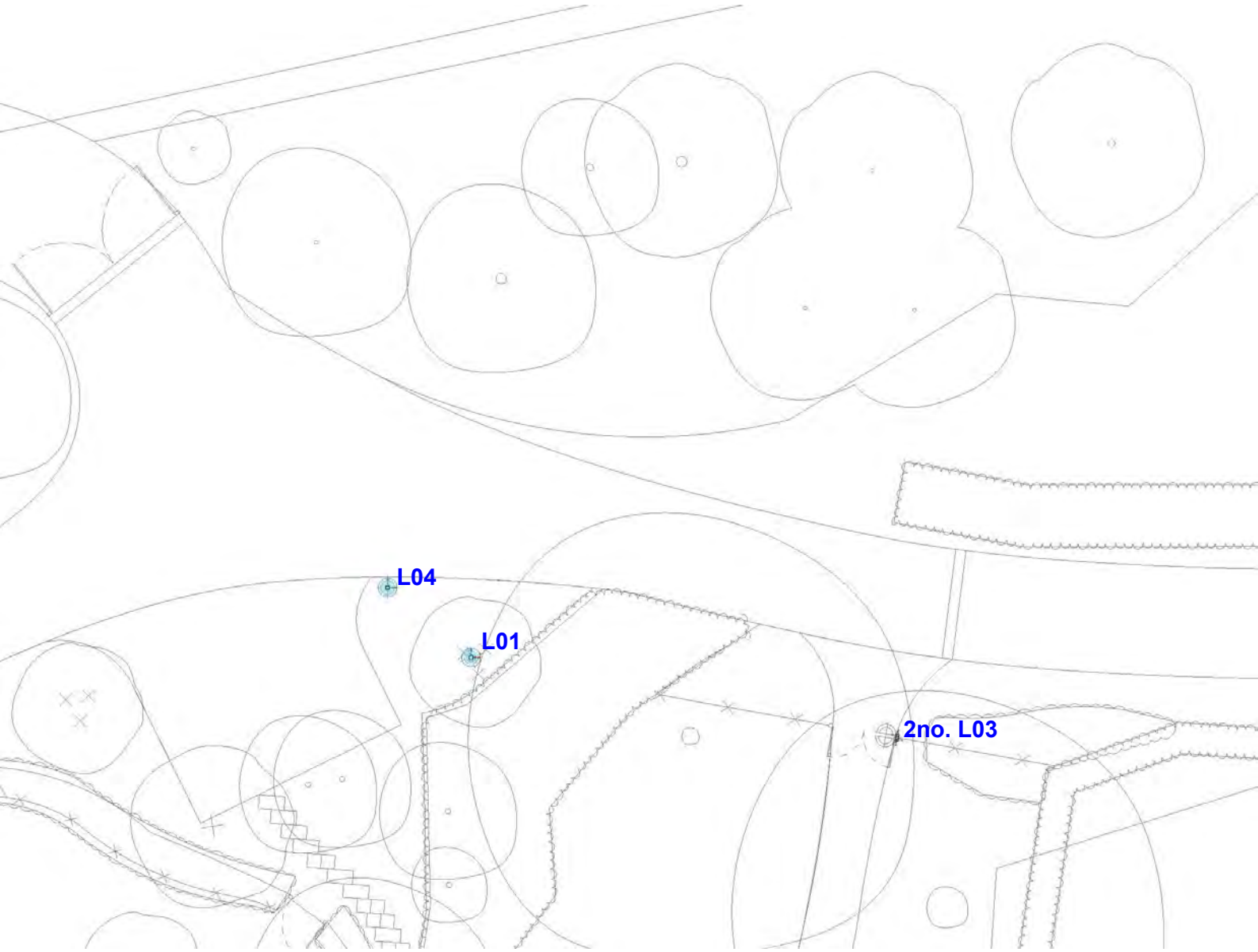
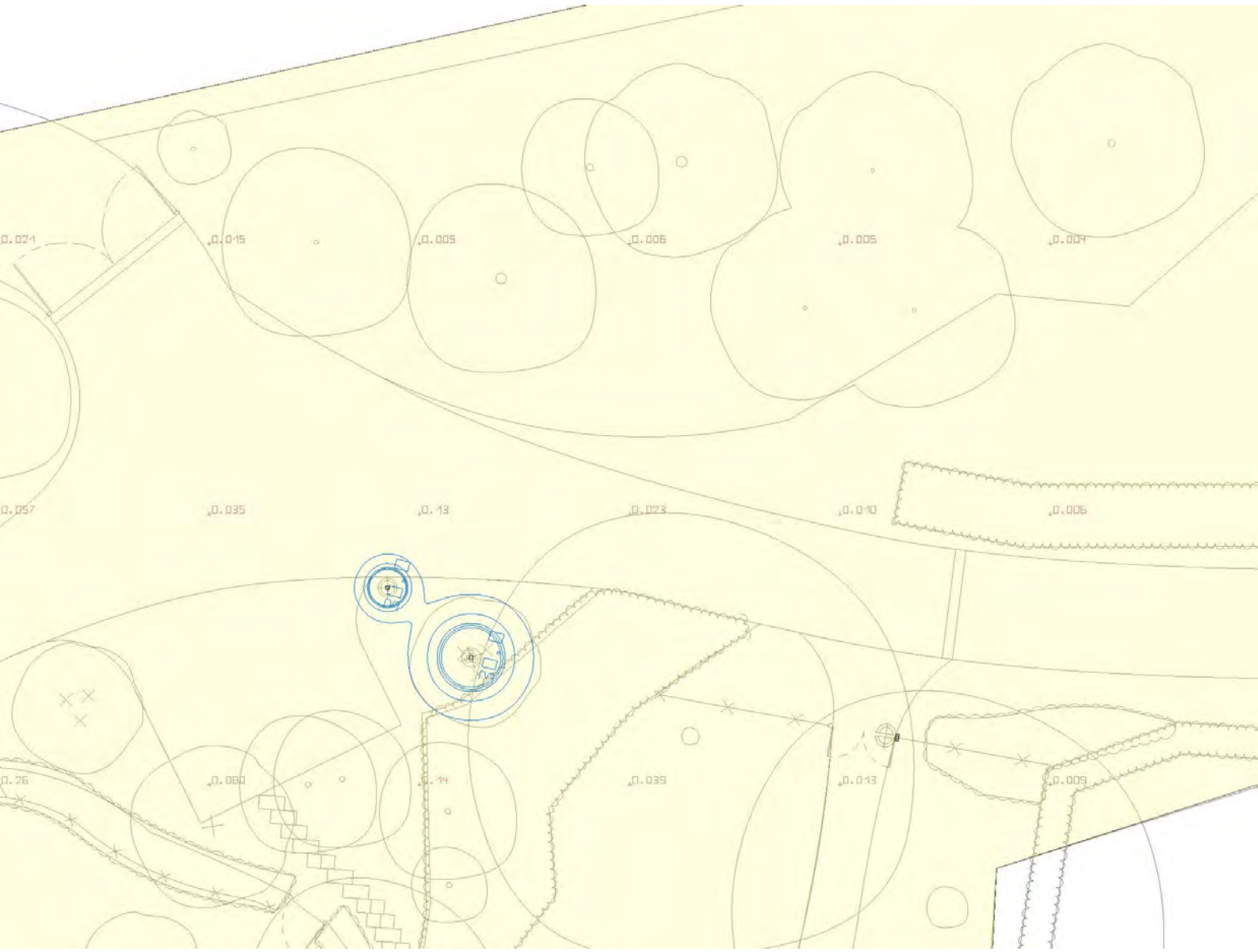


Figure 4.1 - Luminaire Reference Positions - Plan View

Analysis Area 1 Calculation

Isolux Contours and Value Chart

Illuminance (lx)



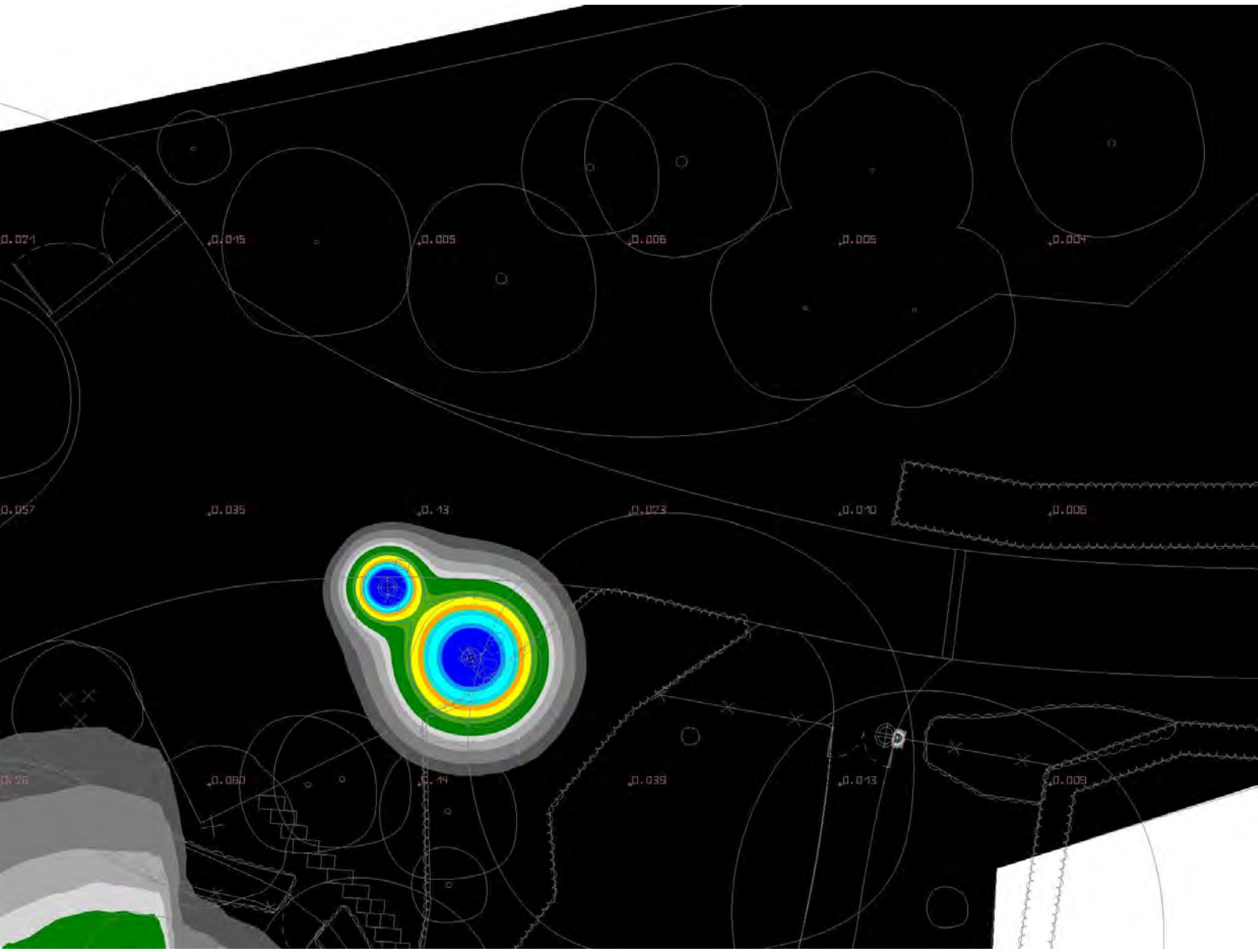
Value Chart Key	Point illuminance values: lx
Isolux Contours Key	Isolux Contours values: lx

Figure 4.2 - Isolux Contours - Plan View

Analysis Area 1 Calculation

False-Colour Illuminance Plots

Lux Level



False-Colour Illuminance Plot Configuration													
Lux Level Indicator													
0.10	0.20	0.30	0.50	0.75	1.00	2.00	3.00	5.00	7.50	10.00	20.00	30.00	lx

Figure 4.3 - False-Colour Illuminance Plot - Plan View

Analysis Area 2 Viewport

Luminaire Locations

Model Viewport

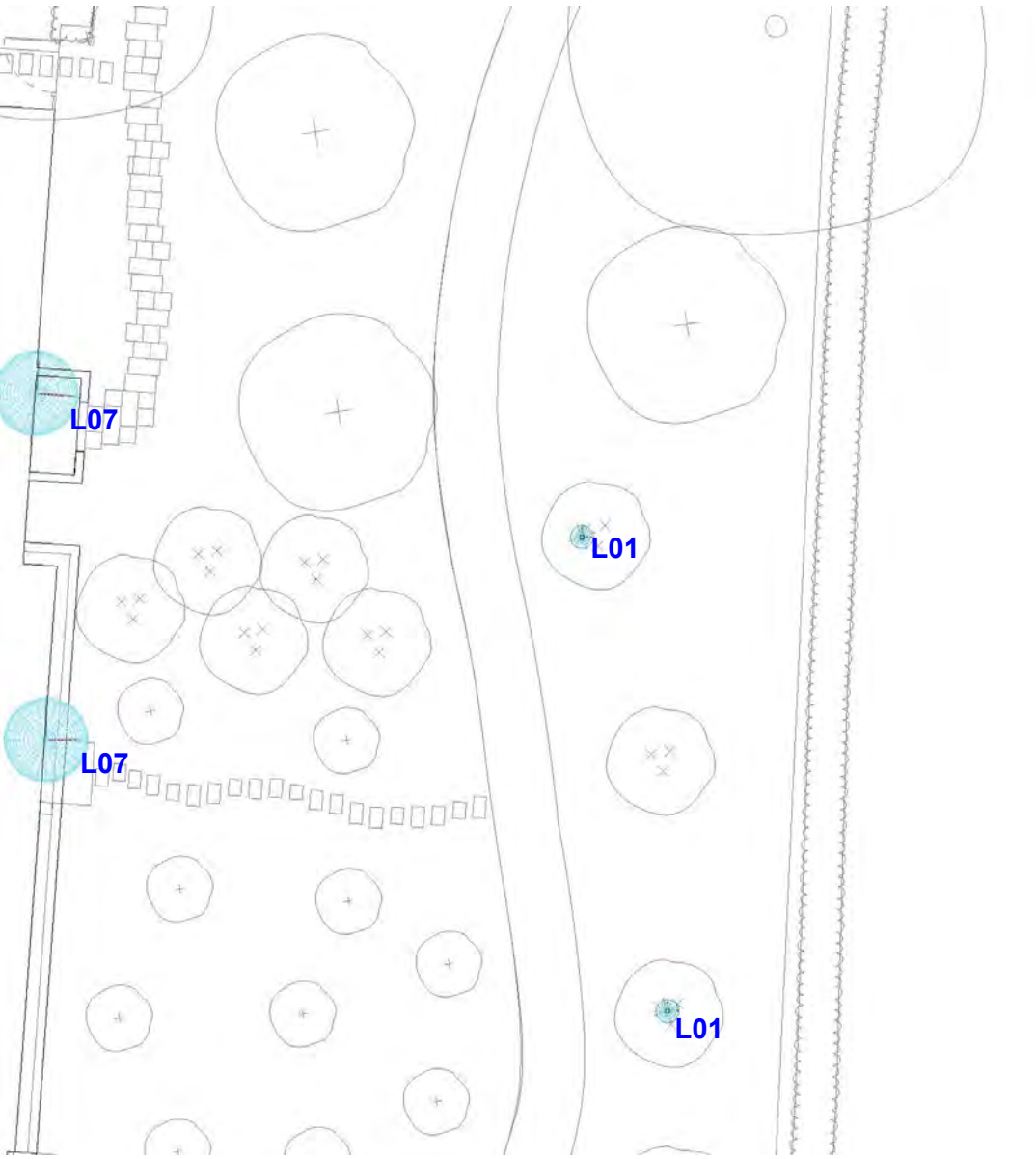
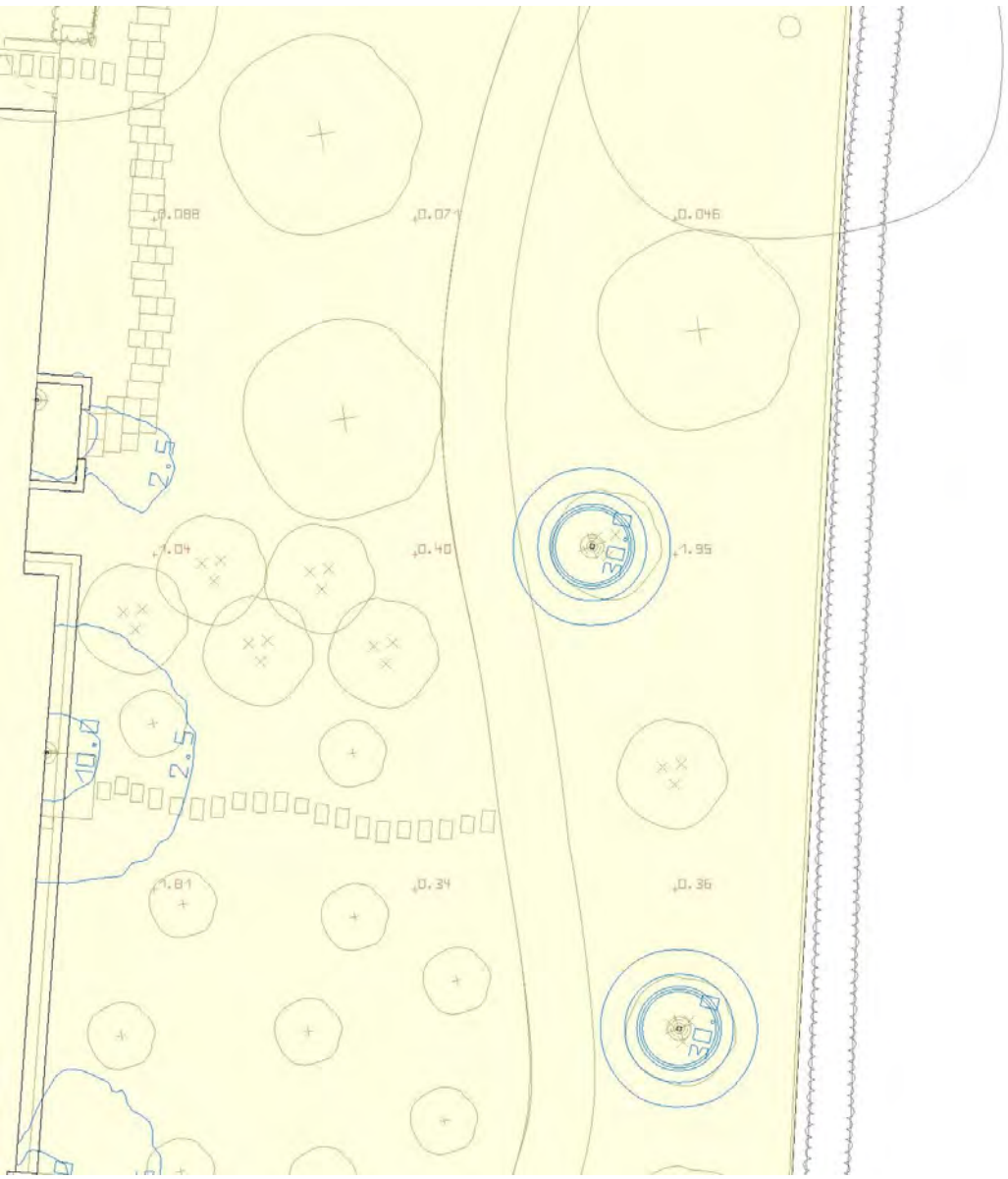


Figure 5.1 - Luminaire Reference Positions - Plan View

Analysis Area 2 Calculation

Isolux Contours and Value Chart

Illuminance (lx)



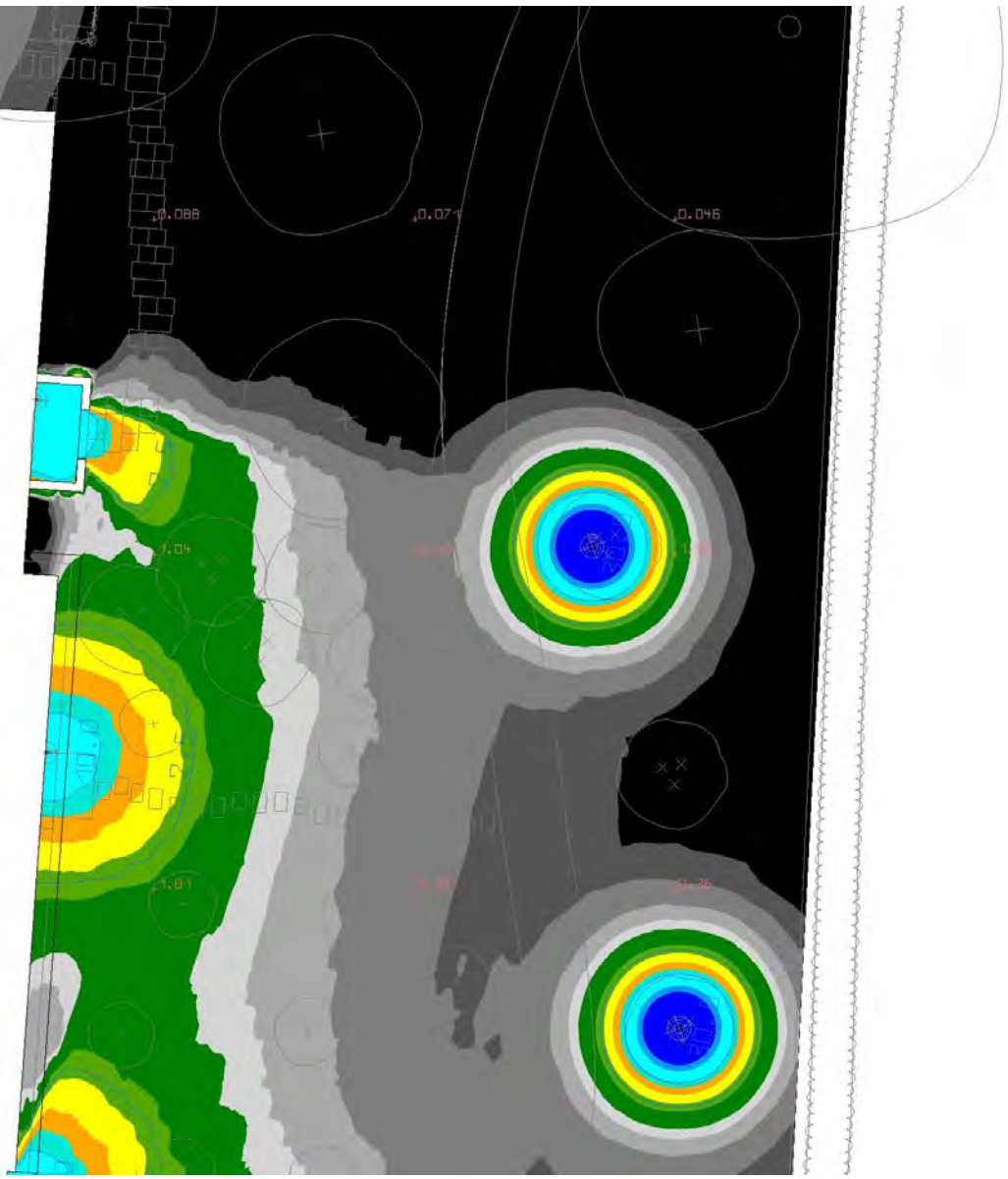
Value Chart Key	Point illuminance values: lx
Isolux Contours Key	Isolux Contours values: lx

Figure 5.2 - Isolux Contours - Plan View

Analysis Area 2 Calculation

False-Colour Illuminance Plots

Lux Level



False-Colour Illuminance Plot Configuration													
Lux Level Indicator													
0.10	0.20	0.30	0.50	0.75	1.00	2.00	3.00	5.00	7.50	10.00	20.00	30.00	lx

Figure 5.3 - False-Colour Illuminance Plot - Plan View

Analysis Area 3 Viewport

Luminaire Locations

Model Viewport

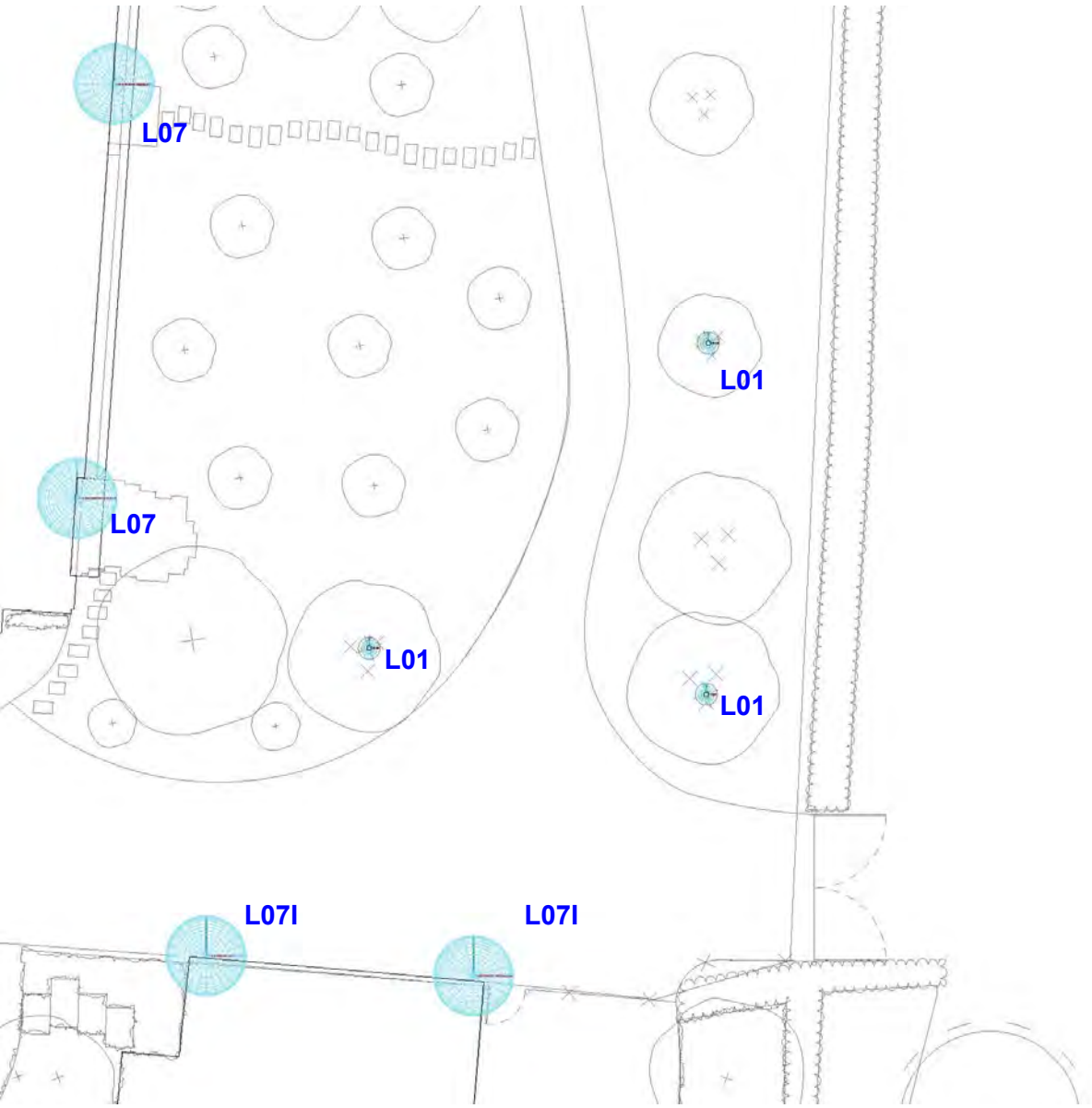
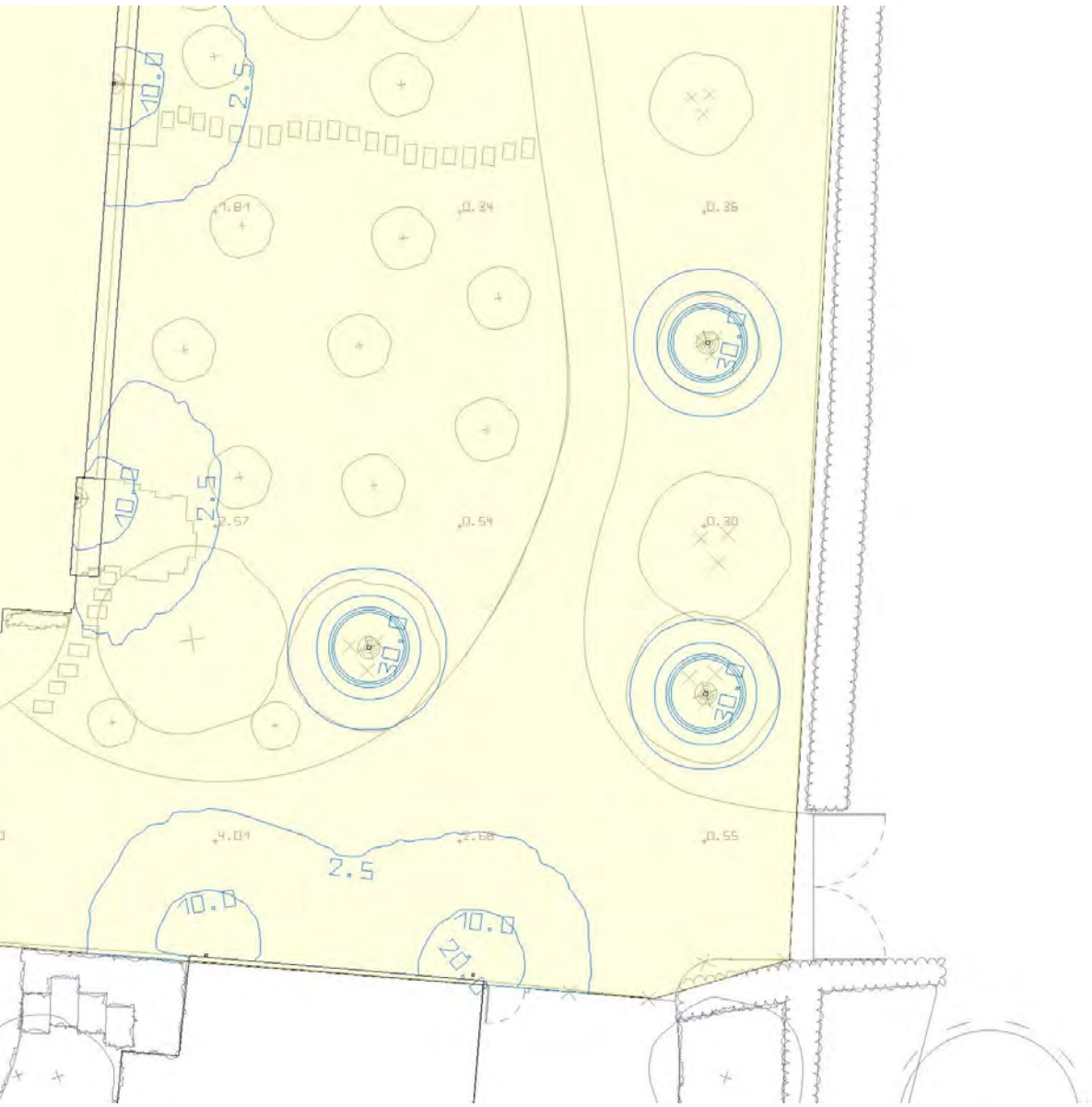


Figure 6.1 - Luminaire Reference Positions - Plan View

Analysis Area 3 Calculation

Isolux Contours and Value Chart

Illuminance (lx)



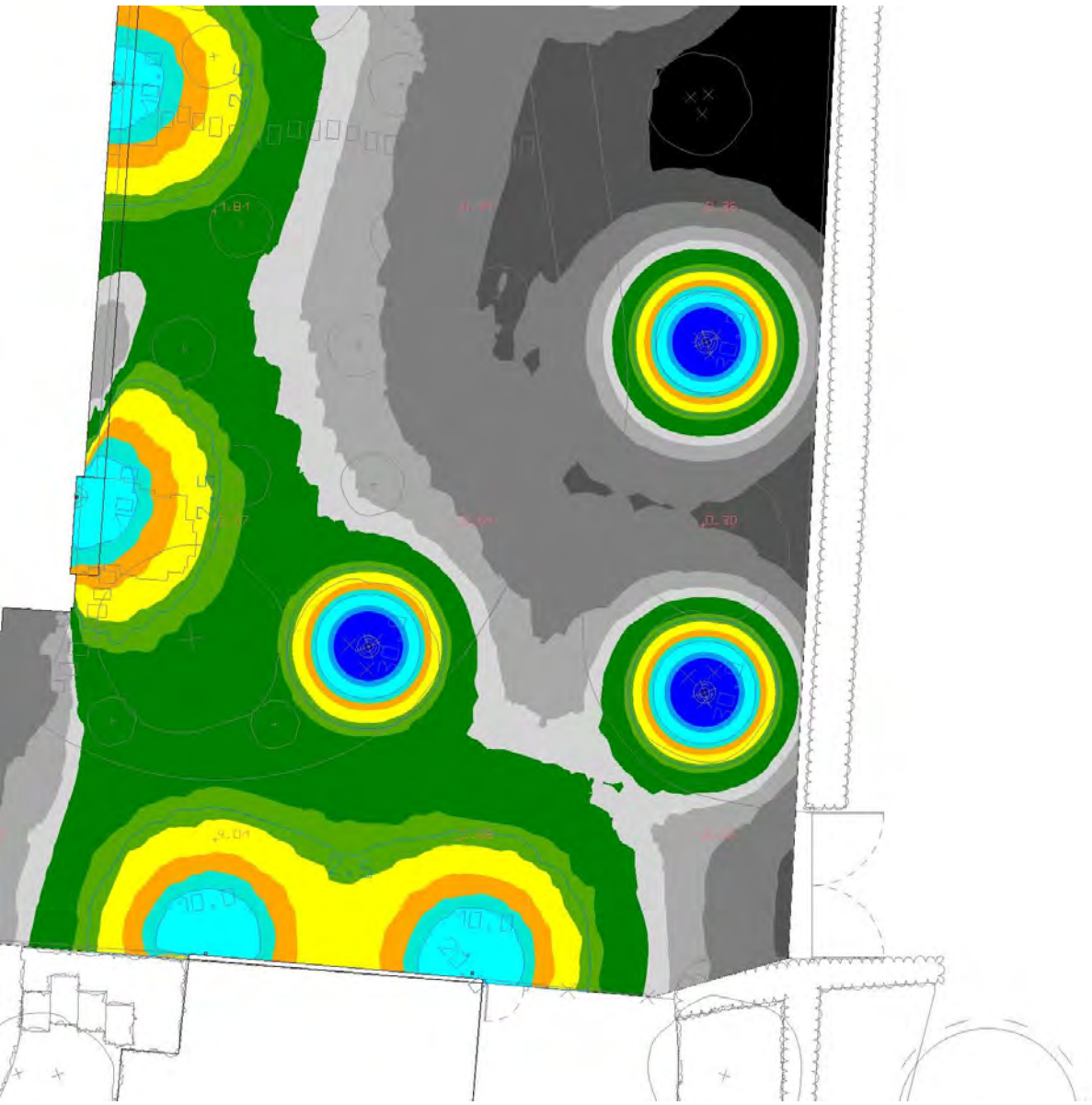
Value Chart Key	Point illuminance values: lx
Isolux Contours Key	Isolux Contours values: lx

Figure 6.2 - Isolux Contours - Plan View

Analysis Area 3 Calculation

False-Colour Illuminance Plots

Lux Level



False-Colour Illuminance Plot Configuration													
Lux Level Indicator													
0.10	0.20	0.30	0.50	0.75	1.00	2.00	3.00	5.00	7.50	10.00	20.00	30.00	lx

Figure 6.3 - False-Colour Illuminance Plot - Plan View

Analysis Area 4 Viewport

Luminaire Locations

Model Viewport

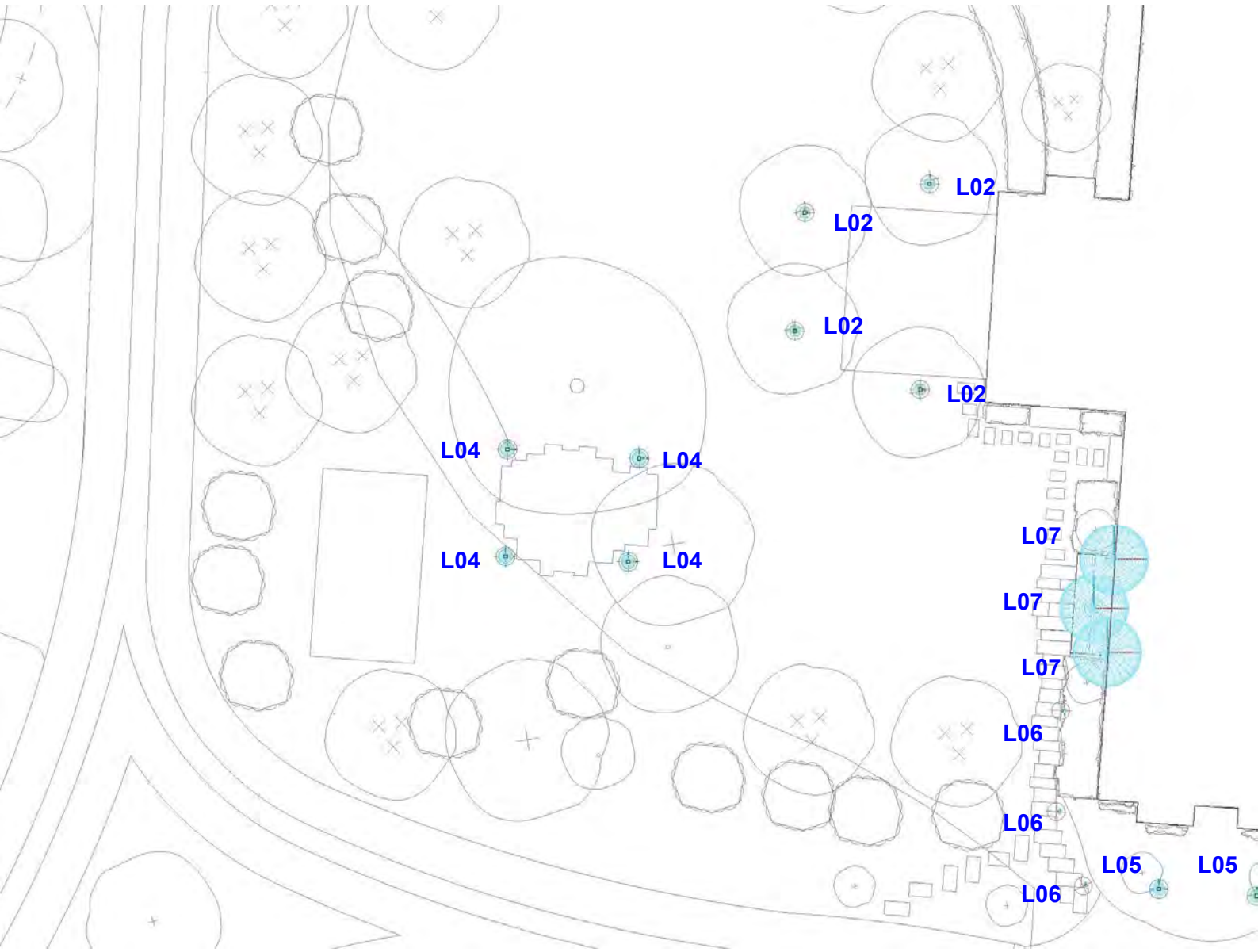
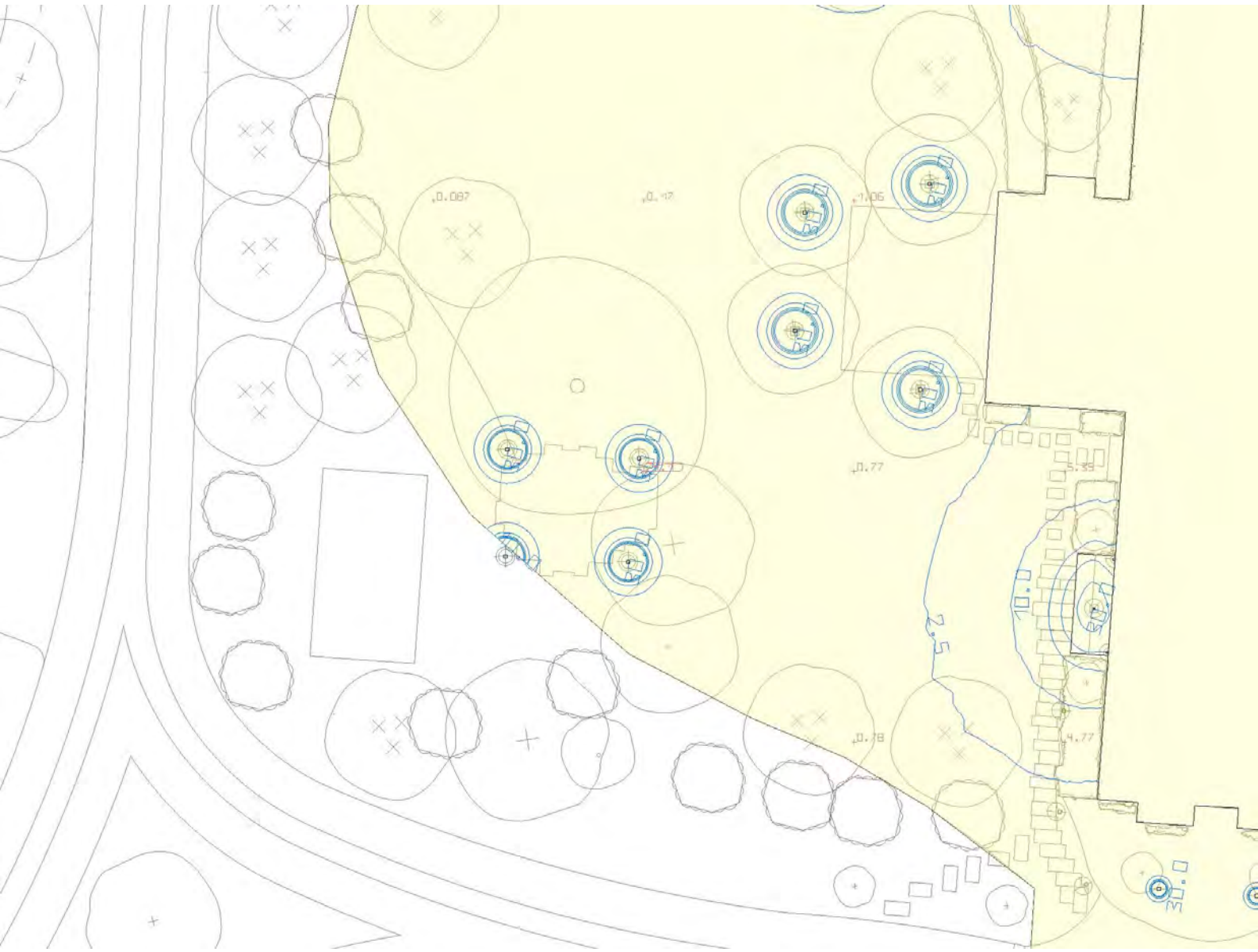


Figure 7.1 - Luminaire Reference Positions - Plan View

Analysis Area 4 Calculation

Isolux Contours and Value Chart

Illuminance (lx)



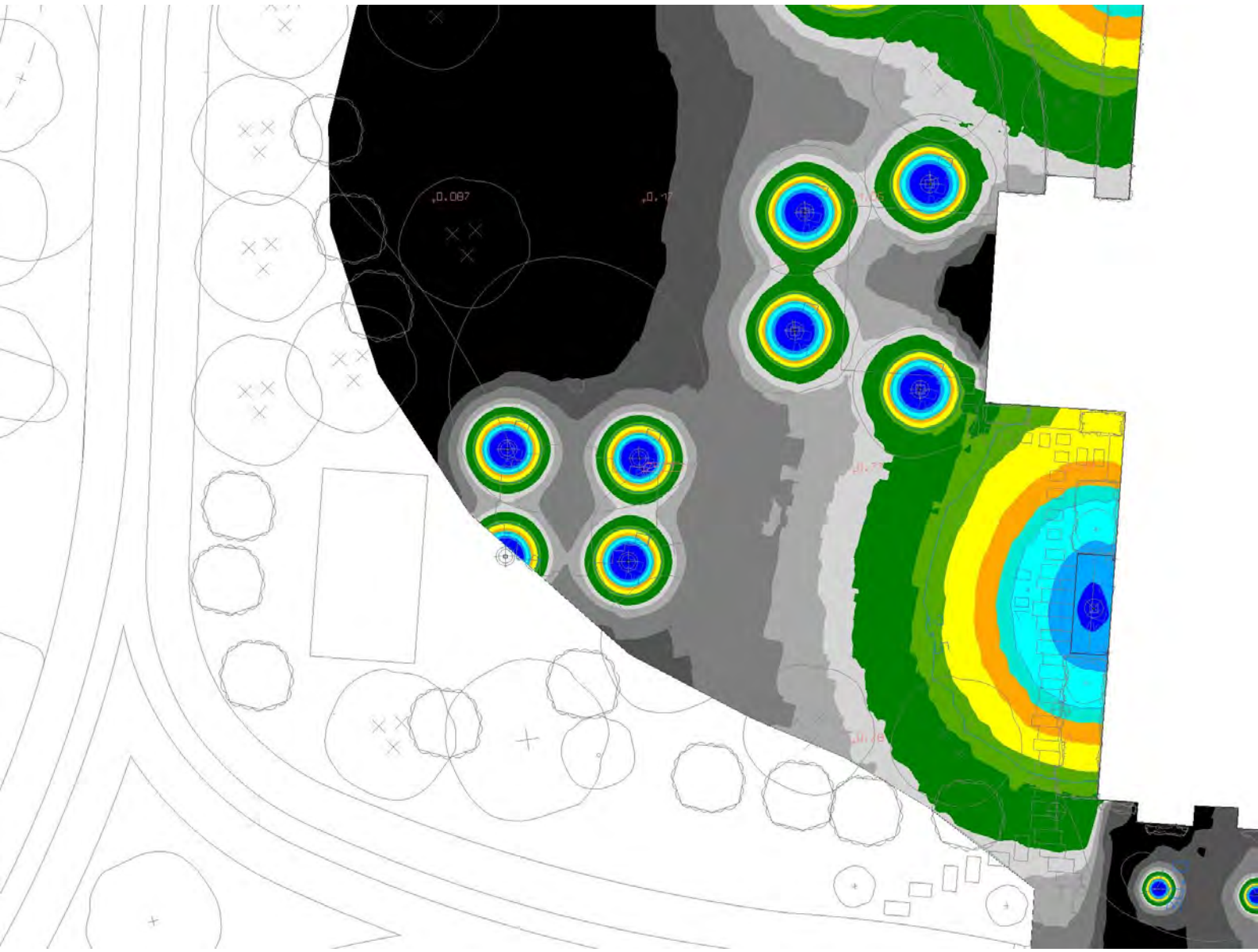
Value Chart Key	Point illuminance values: lx
Isolux Contours Key	Isolux Contours values: lx

Figure 7.2 - Isolux Contours - Plan View

Analysis Area 4 Calculation

False-Colour Illuminance Plots

Lux Level



False-Colour Illuminance Plot Configuration													
Lux Level Indicator													
0.10	0.20	0.30	0.50	0.75	1.00	2.00	3.00	5.00	7.50	10.00	20.00	30.00	lx

Figure 7.3 - False-Colour Illuminance Plot - Plan View

Analysis Area 5 Viewport

Luminaire Locations

Model Viewport

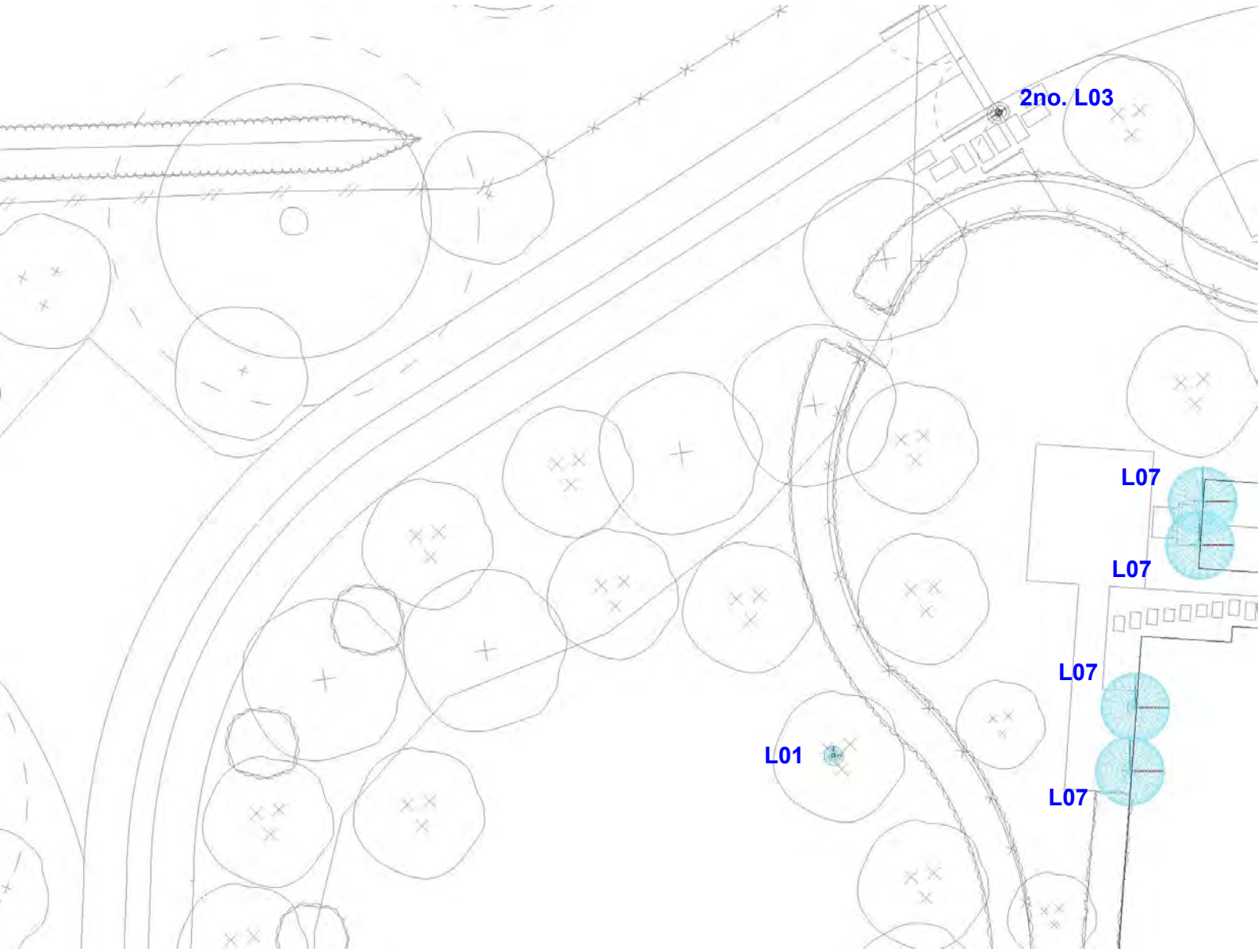
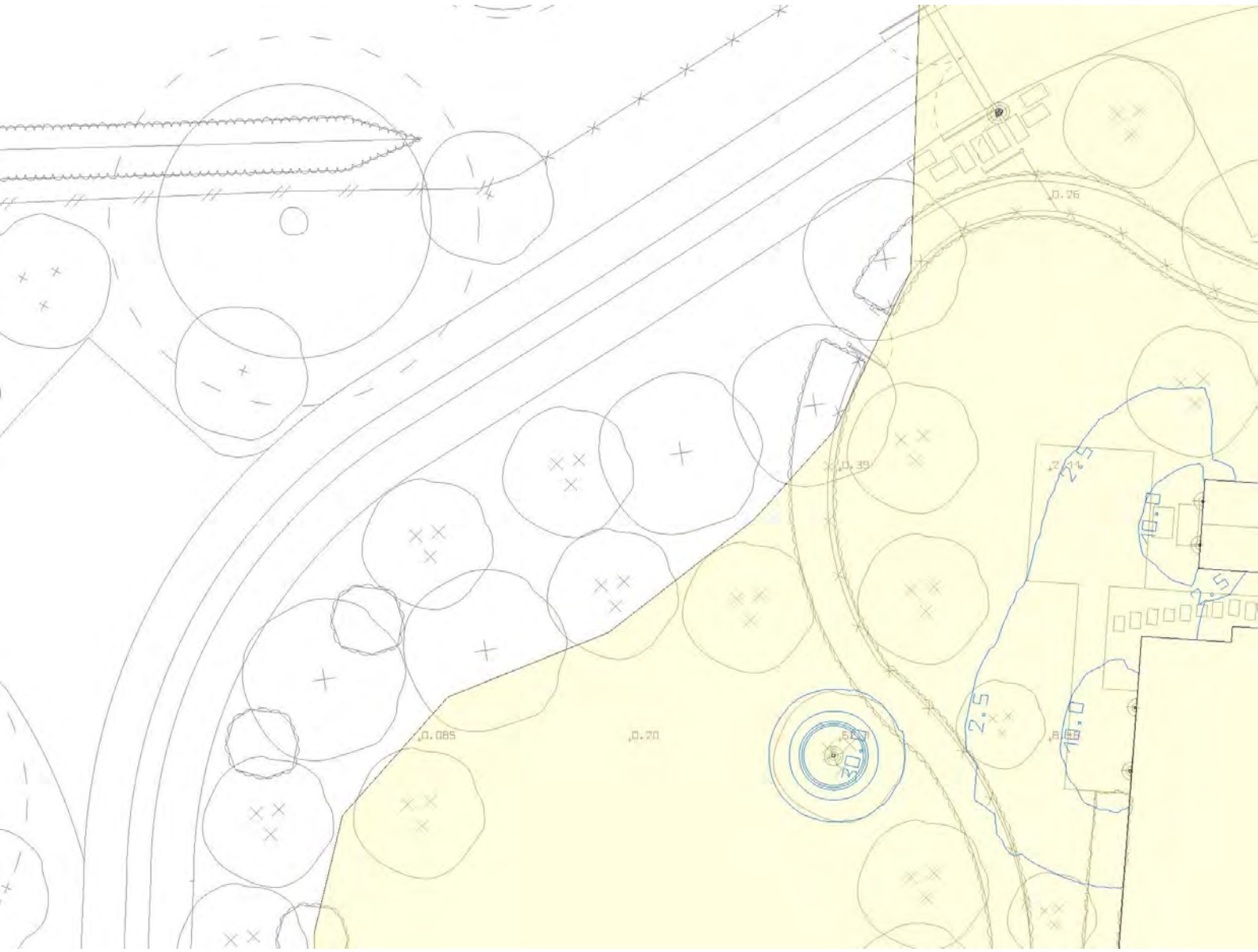


Figure 8.1 - Luminaire Reference Positions - Plan View

Analysis Area 5 Calculation

Isolux Contours and Value Chart

Illuminance (lx)



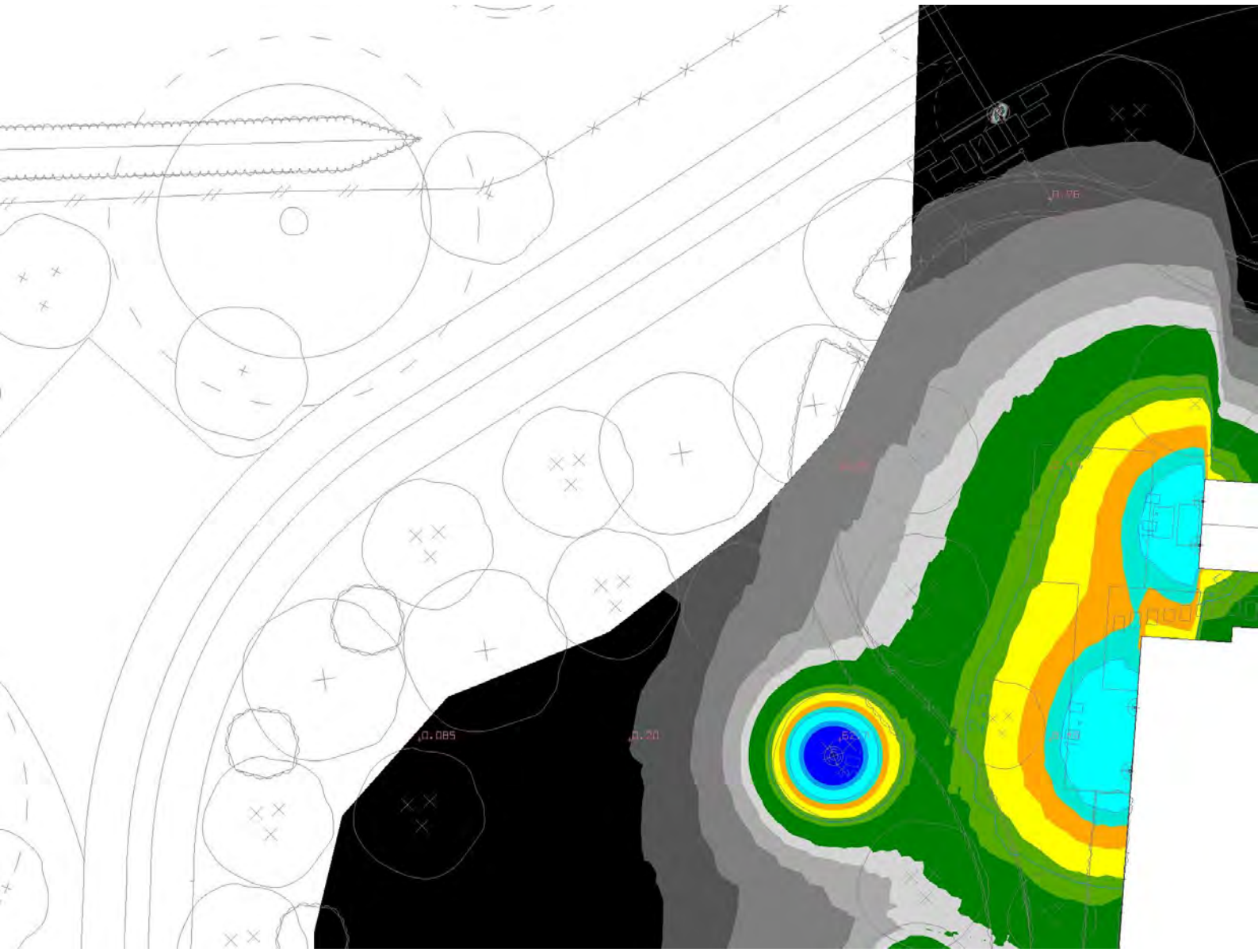
Value Chart Key	Point illuminance values: lx
Isolux Contours Key	Isolux Contours values: lx

Figure 8.2 - Isolux Contours - Plan View

Analysis Area 5 Calculation

False-Colour Illuminance Plots

Lux Level



False-Colour Illuminance Plot Configuration													
Lux Level Indicator													
0.10	0.20	0.30	0.50	0.75	1.00	2.00	3.00	5.00	7.50	10.00	20.00	30.00	lx

Figure 8.3 - False-Colour Illuminance Plot - Plan View

Specification

Model Calculation

Luminaire Reference List

Ref.	Manufacturer	Model	Quantity	Wattage	Luminous Flux	Mounting Heights	CCT	CRI
L01	Hudson Lighting	Multi Stem Master	6	3.6W	227 lm	2.0m	2700K	≥90
L02	Hudson Lighting	Downward Tree Spot	4	3.6W	107 lm	>1.7m		
L03	Hudson Lighting	Eyelid	4	2.6W	31 lm	>0.5m		
L04	Hudson Lighting	Downward Spike Spot	4	2.6W	166 lm	0.8m		
L05	Hudson Lighting	Planting Downlight	2	2.6W	166 lm	0.3m		
L06	Hudson Lighting	Path Marker	3	1.6W	13 lm	>0.1m		
L07	Santorini	E27 Bulb	12	8.0W	870 lm	>1.8m	2700K	≥80

All luminaires have been modelled at 100% output to represent the maximum potential light contribution within the calculation. This approach intentionally represents a higher-impact scenario than the anticipated installed operation, allowing the assessment to demonstrate the maximum potential illuminance and light spill associated with the proposed scheme.

Figure 9.0 - Luminaire Model Designations

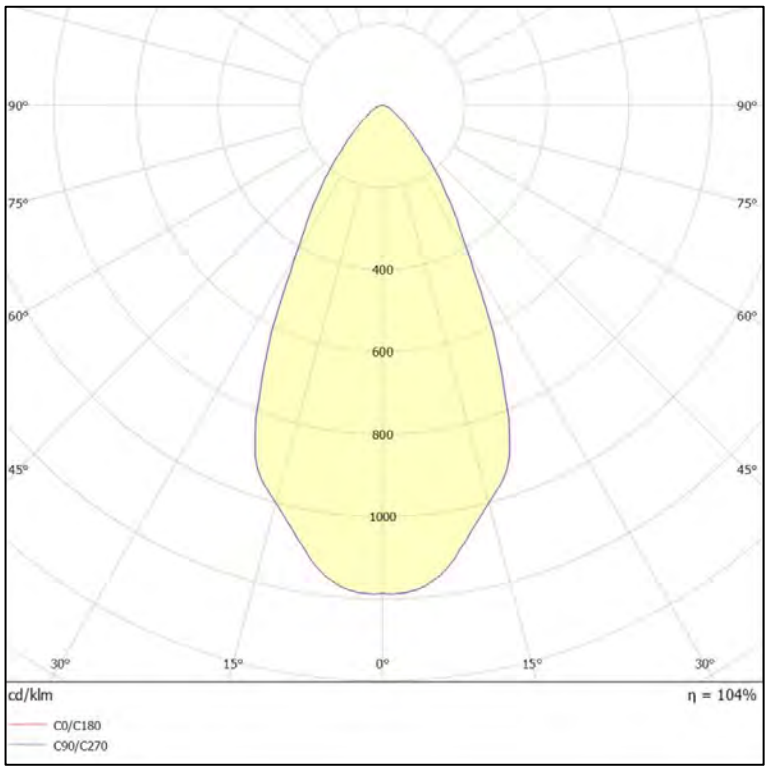
L01

Hudson Lighting - Multi Stem Master

Model Data Sheet



Polar Curve



Cone Diagram

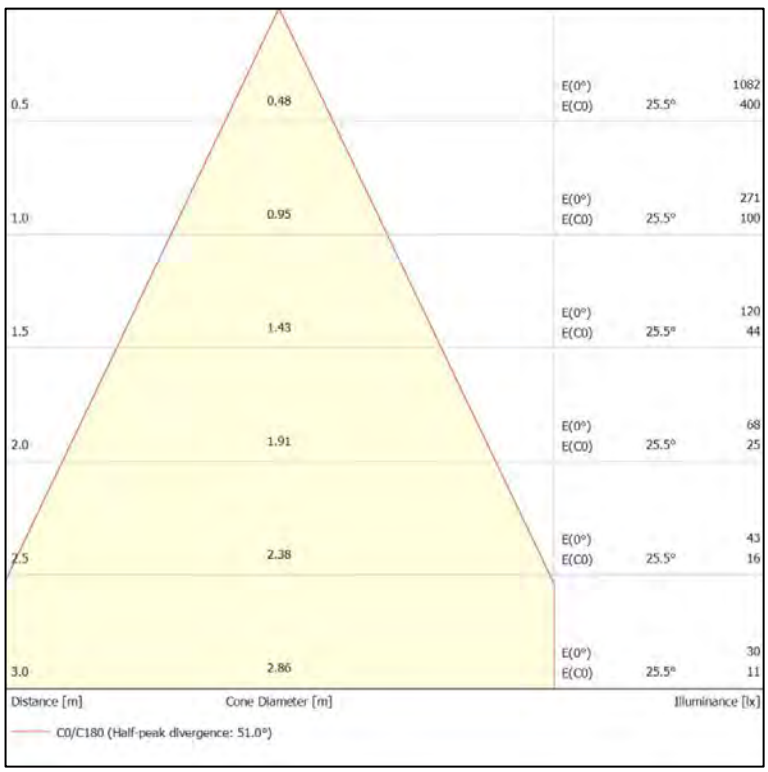


Figure 9.1 - L01 - Lighting Calculation IES Software Import Information

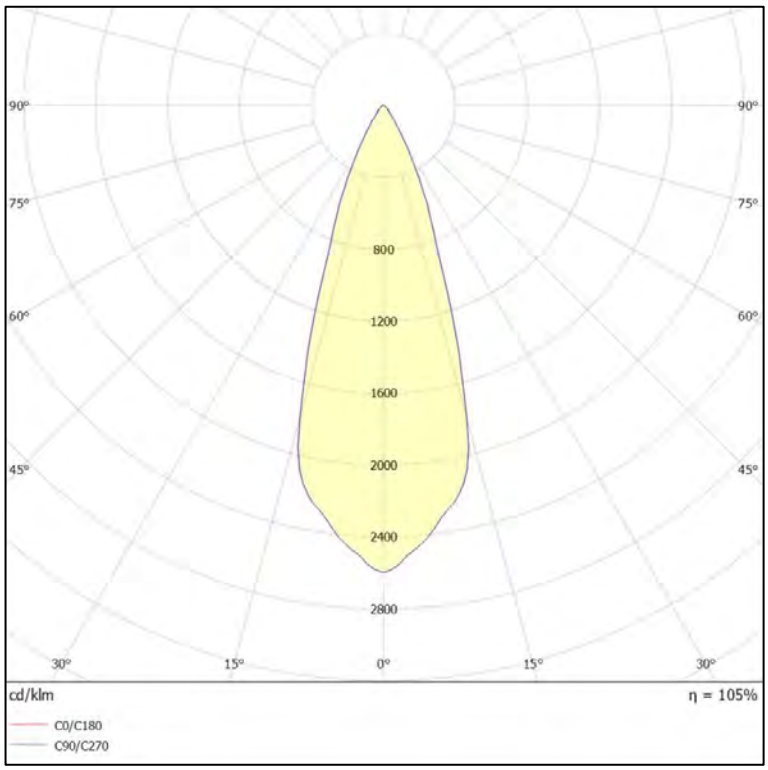
L02

Hudson Lighting - Downward Tree Spot

Model Data Sheet



Polar Curve



Cone Diagram

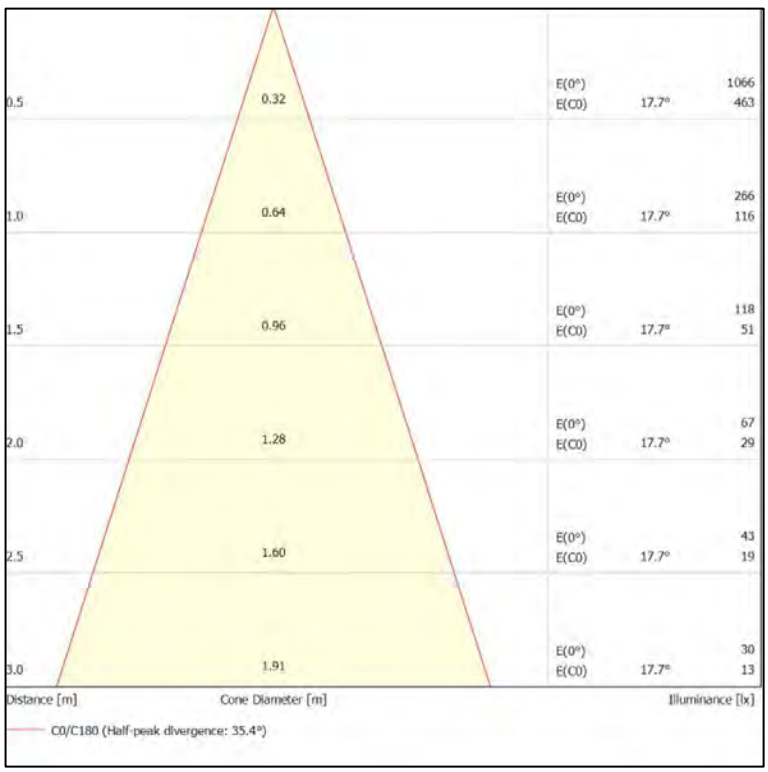


Figure 9.2 - L02 - Lighting Calculation IES Software Import Information

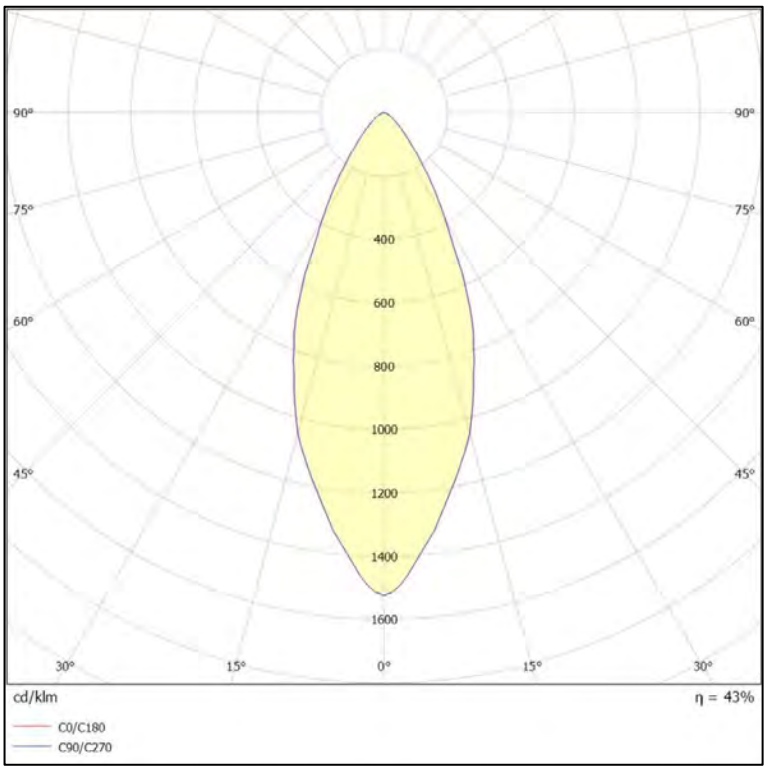
L03

Hudson Lighting - Eyelid

Model Data Sheet



Polar Curve



Cone Diagram

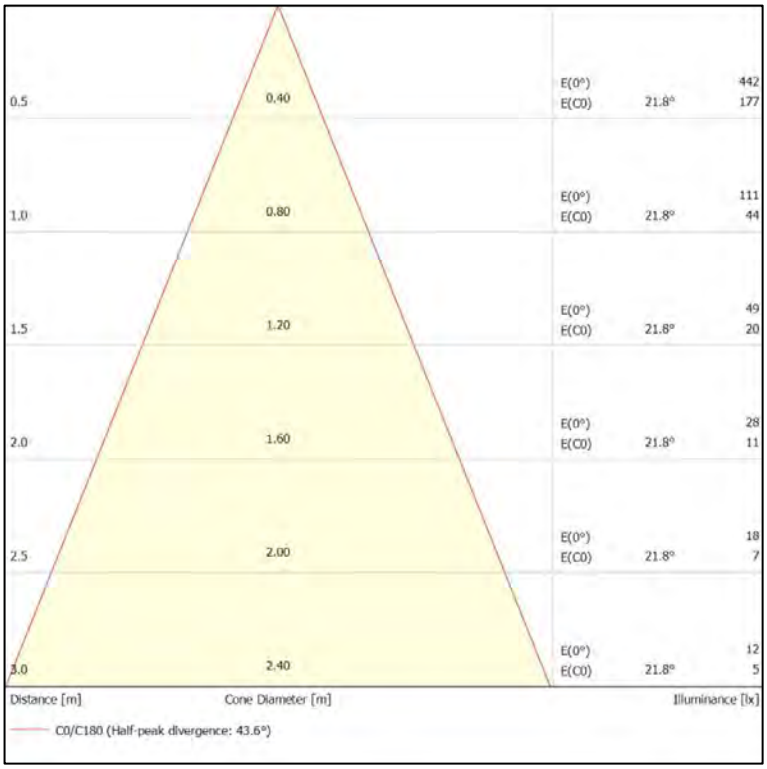


Figure 9.3 - L03 - Lighting Calculation IES Software Import Information

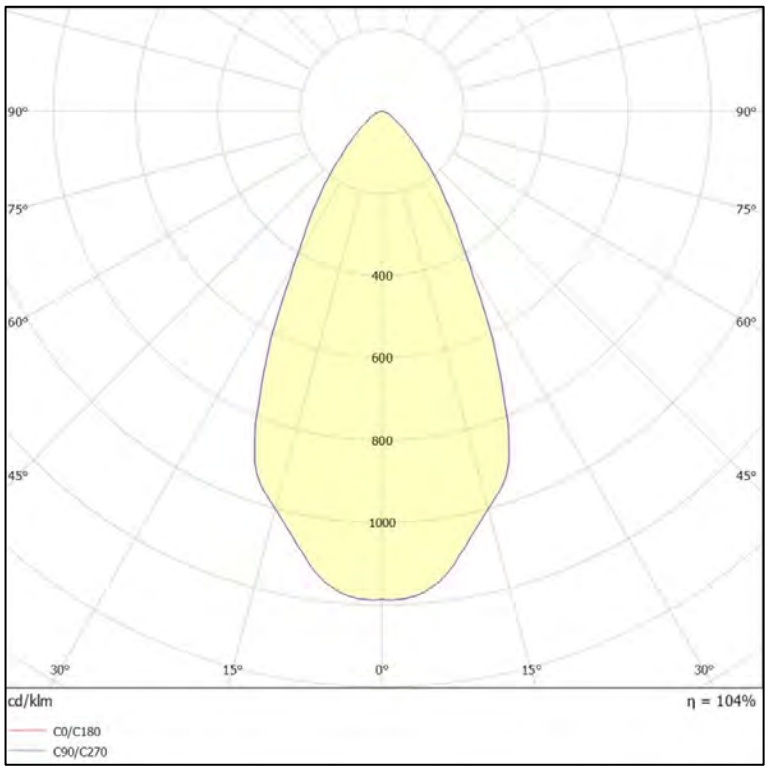
L04

Hudson Lighting - Downward Spike Spot

Model Data Sheet



Polar Curve



Cone Diagram

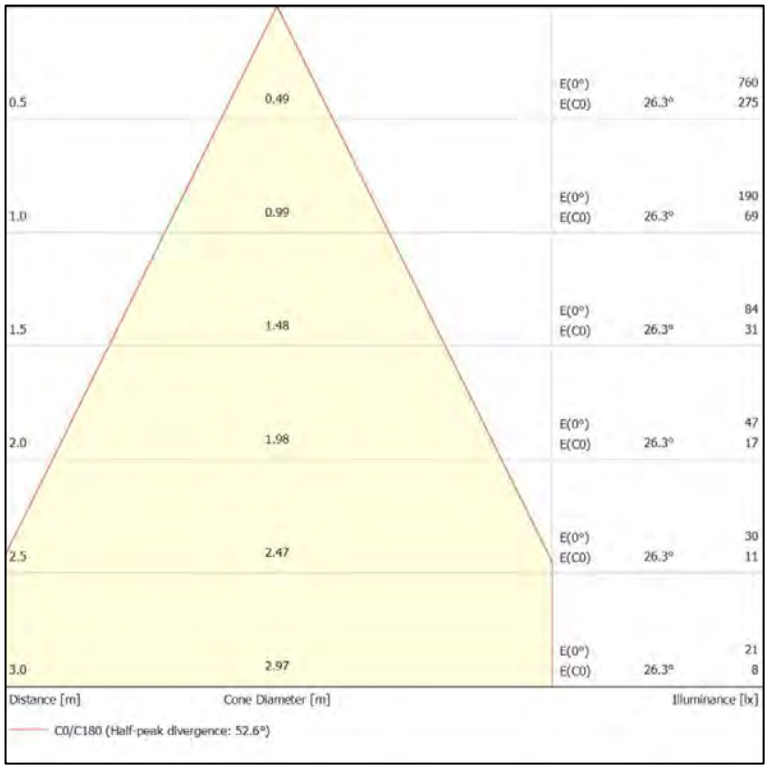


Figure 9.4 - L04 - Lighting Calculation IES Software Import Information

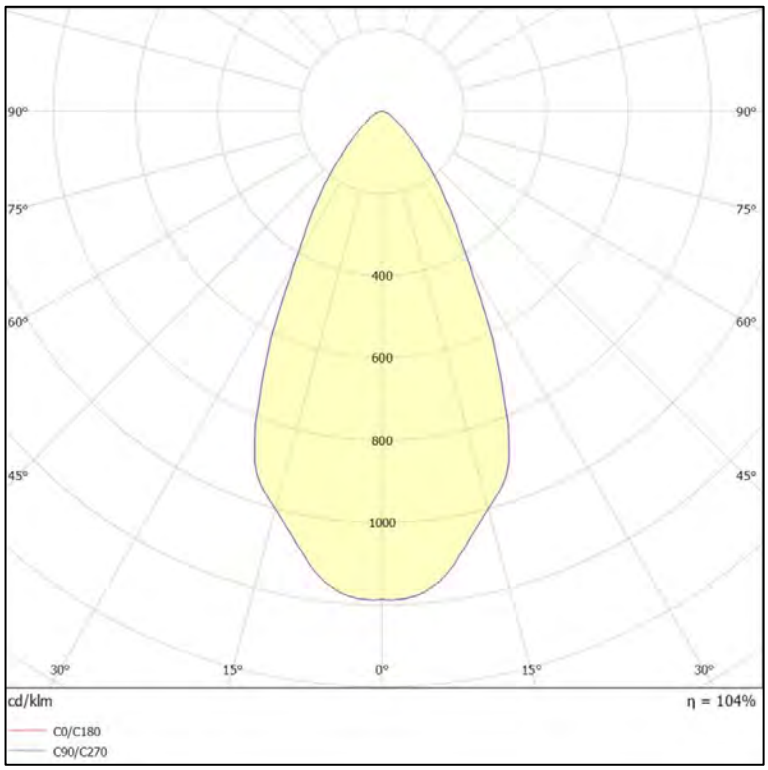
L05

Hudson Lighting - Planting Downlight

Model Data Sheet



Polar Curve



Cone Diagram

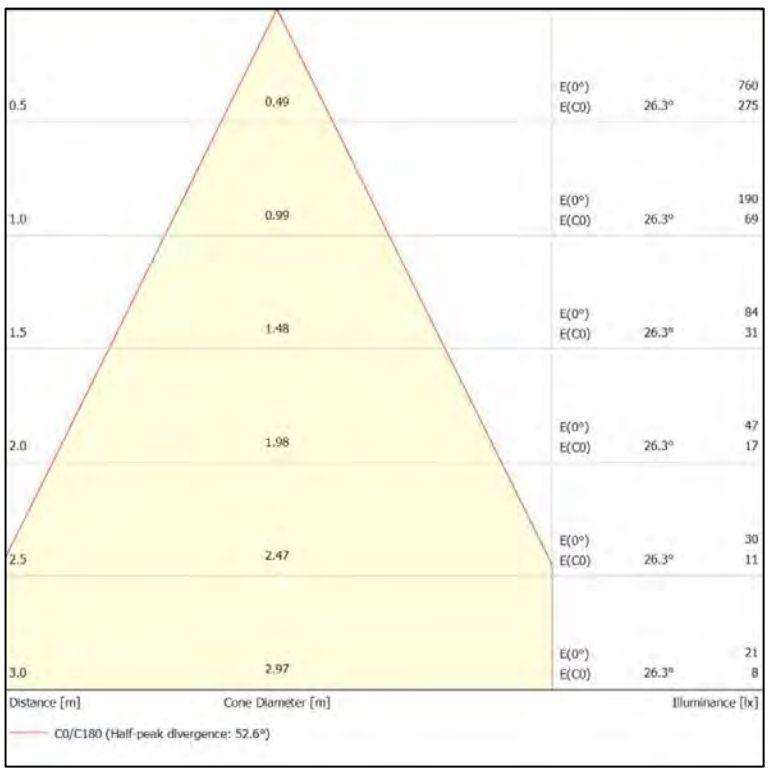


Figure 9.5 - L05 - Lighting Calculation IES Software Import Information

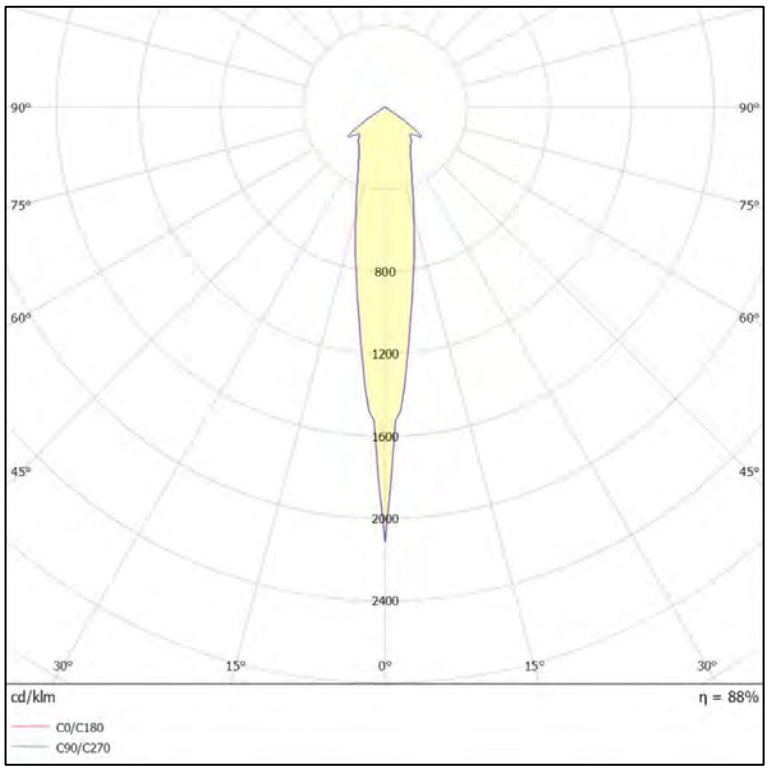
L06

Hudson Lighting - Path Marker

Model Data Sheet



Polar Curve



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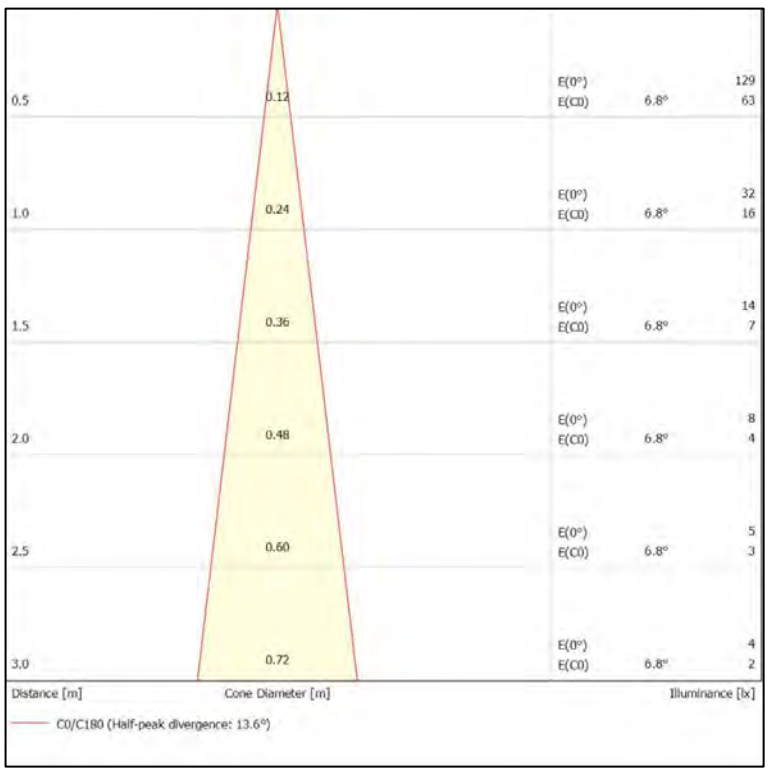


Figure 9.6 - L06 - Lighting Calculation IES Software Import Information

L07

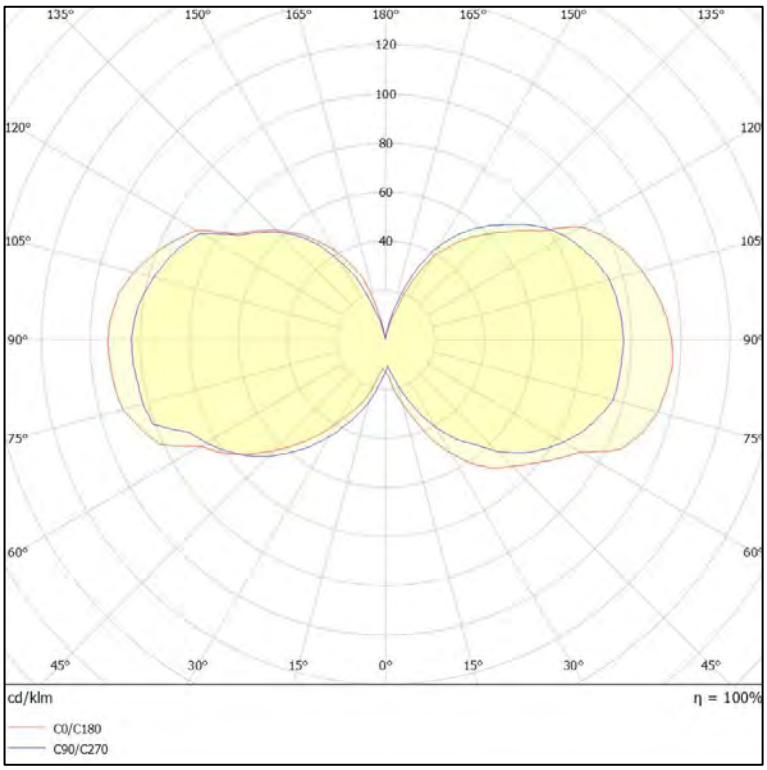
E27 Bulb - Wall Lights

Model Data Sheet



Note: Bare-lamp photometry has intentionally been used to represent a conservative worst-case condition. The installed luminaire housing will provide additional control of the light distribution.

Polar Curve



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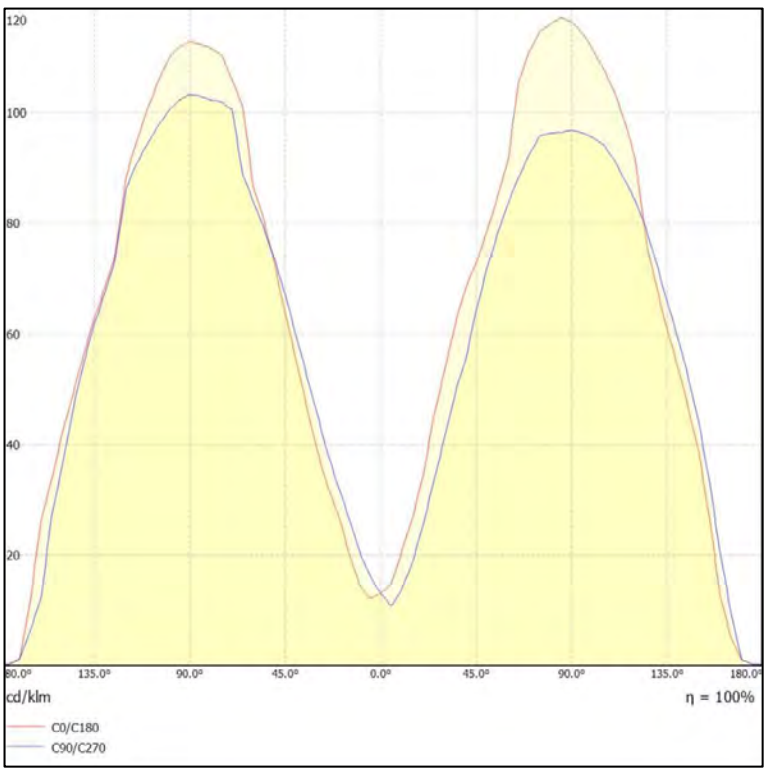


Figure 9.7 - L07 - Lighting Calculation IES Software Import Information

Site-Wide Calculation Surface Values

Overview

Landscape

Calculation Plane	Average Illuminance	Minimum Illuminance	Maximum Illuminance
Site-Wide Calculation Surface Perpendicular illuminance (adaptive) Height: 00.10 m, Wall zone: 00.00 m	1.77 lx	0.001 lx	5.39

Note:
Due to the nature and intended use of the external landscape lighting scheme, target illuminance values are not used as performance benchmarks and do not form part of the primary assessment criteria.

The calculated values are presented to demonstrate the anticipated illuminance distribution and extent of potential light spill under the modelled worst-case condition.

Localised maximum values occur immediately adjacent to individual luminaires and are not representative of illuminance levels across the identified ecologically sensitive routes.

The reported average illuminance represents the static worst-case calculation condition, with all luminaires operating simultaneously at their modelled output. It does not account for the proposed PIR/motion-control strategy, under which relevant luminaires will operate only when triggered and for a short duration of approximately one minute. The duration and extent of illumination experienced during normal operation will therefore be substantially lower than represented by the static calculation.

Figure 10.0 - Perpendicular Illuminance

Conclusion

Summary of Findings

Landscape

The lighting calculations demonstrate that the proposed external lighting scheme is predominantly low-level, localised and controlled. The design has been reviewed in conjunction with the bat flightline and dark-corridor recommendations prepared by Collington Winter Environmental Ltd. Particular consideration has been given to limiting light spill toward identified bat commuting and foraging corridors, retained vegetation and known roost locations.

The design continues to use the same low-output, warm-white, predominantly downward-directed luminaires adopted elsewhere across the Hope Farm development. These fittings have been selected to provide illumination only where required, while limiting unnecessary light spill into surrounding landscape areas, vegetation and the wider site.

Across the calculation surface, the model records an average perpendicular illuminance of approximately 1.77 lux, with minimum values reducing to approximately 0.001 lux in the darker areas of the site. The Isolux Contours plots demonstrate that higher illuminance remains concentrated immediately around individual luminaires and intended landscape features, with light levels reducing significantly away from these locations.

Condition 6 does not prescribe a single numerical illuminance threshold. The assessment has therefore considered the ecological lighting criteria previously adopted for the Farmhouse development area together with the recommendations of the project ecologist. The proposed lighting approach incorporates measures intended to minimise unnecessary illumination of the nocturnal environment, including warm colour temperatures, low luminous outputs, controlled light distribution and restricted operating periods.

The calculations also use conservative assumptions, including a maintenance factor of 1.0, maximum lamp outputs, and no reliance on additional architectural shading or vegetation to reduce spill. Actual installed light levels are therefore expected to be equal to or lower than those presented within the assessment.

Subject to the final luminaires, colour temperatures, outputs, mounting heights, shielding, aiming and control strategy remaining consistent with the assessed design, the proposed lighting strategy is intended to maintain the ecological mitigation principles established for Hope Farm. Final installation should retain the identified dark corridors, applicable roost exclusion zones and specified light-control measures, with any subsequent changes affecting these areas reviewed with the project ecologist.

Overall, the scheme demonstrates that the proposed lighting can provide the intended localised landscape and access illumination while maintaining a restrained external lighting environment. The design incorporates the ecological mitigation principles previously established for Hope Farm, including controlled light distribution, warm colour temperatures, minimised operating periods and protection of identified sensitive landscape areas. Subject to the final installation remaining consistent with the assessed luminaire types, outputs, locations, mounting heights, aiming and control strategy, the proposed lighting is considered to maintain the biodiversity-sensitive design intent required by Condition 6.

Glossary

C

CCT	(Engl. correlated colour temperature) Body temperature of a thermal radiator which serves to describe its light colour. Unit: Kelvin [K]. The lesser the numerical value the redder; the greater the numerical value the bluer the light colour. The colour temperature of gas-discharge lamps and semiconductors are termed "correlated colour temperature" in contrast to the colour temperature of thermal radiators. Allocation of the light colours to the colour temperature ranges acc. to EN 12464-1: Light colour - colour temperature [K] warm white (ww) < 3,300 K neutral white (nw) | 3,300 – 5,300 K daylight white (dw) > 5,300 K
CRI	(Engl. colour rendering index) Designation for the colour rendering index of a luminaire or a lamp acc. to DIN 6169: 1976 or CIE 13.3: 1995. The general colour rendering index Ra (or CRI) is a dimensionless figure that describes the quality of a white light source in regards to its similarity with the remission spectra of defined 8 test colours (see DIN 6169 or CIE 1974) to a reference light source.

E

Environmental zones	The assessment of intrusive light and light immission depends on the environment of the lighting installation. Depending on the standard, 4-6 different zones are defined, ranging from highly protected areas in natural settings to urban areas, commercial zones, and industrial zones.

G

g1	Often also Uo (Engl. overall uniformity) Designates the overall uniformity of the illuminance on a surface. It is the quotient from Emin to E and is required, for instance, in standards for illumination of workstations.
g2	Actually it designates the "non-uniformity" of the illuminance on a surface. It is the quotient of Emin to Emax and is generally only relevant for certifying the emergency lighting acc. to EN 1838.

I

Illuminance	Describes the ratio of the luminous flux that strikes a certain surface to the size of this surface (lm/m² = lx). The illuminance is not tied to an object surface. It can be determined anywhere in space (inside or outside). The illuminance is not a product feature because it is a recipient value. Lux Meters are used for measuring. Unit: Lux Abbreviation: lx Formula symbol: E

L

LMF	(Engl. luminaire maintenance factor)/acc. to CIE 97: 2005 Luminaire maintenance factor that takes the soiling into account of the luminaire in the course of the operating time. The luminaire maintenance factor is specified as a decimal digit and can have a maximum value of 1 (no soiling existing).

M

MF	(Engl. maintenance factor)/acc. to CIE 97: 2005 Maintenance factor as decimal number between 0 and 1 that describes the ratio of the new value of a photometric planning parameter (e.g. of the illuminance) to a maintenance value after a certain time. The maintenance factor takes into account the soiling of luminaires and rooms as well as the luminous flux reduction and the failure of light sources. The maintenance factor is taken into account either overall or determined in detail acc. to CIE 97: 2005.

O

Operating times	The assessment of obtrusive light and light immission depends on the operating times of the lighting installation. Depending on the standard, 1-3 different operating times are specified. In the absence of specific details, an operating time between 06:00 and 22:00 can be assumed.

W

Working Plane	Virtual measuring or calculation surface at the height of the visual task that generally follows the room geometry. The working plane may also feature a wall zone.

Appendix

Artificial Lighting Calculation

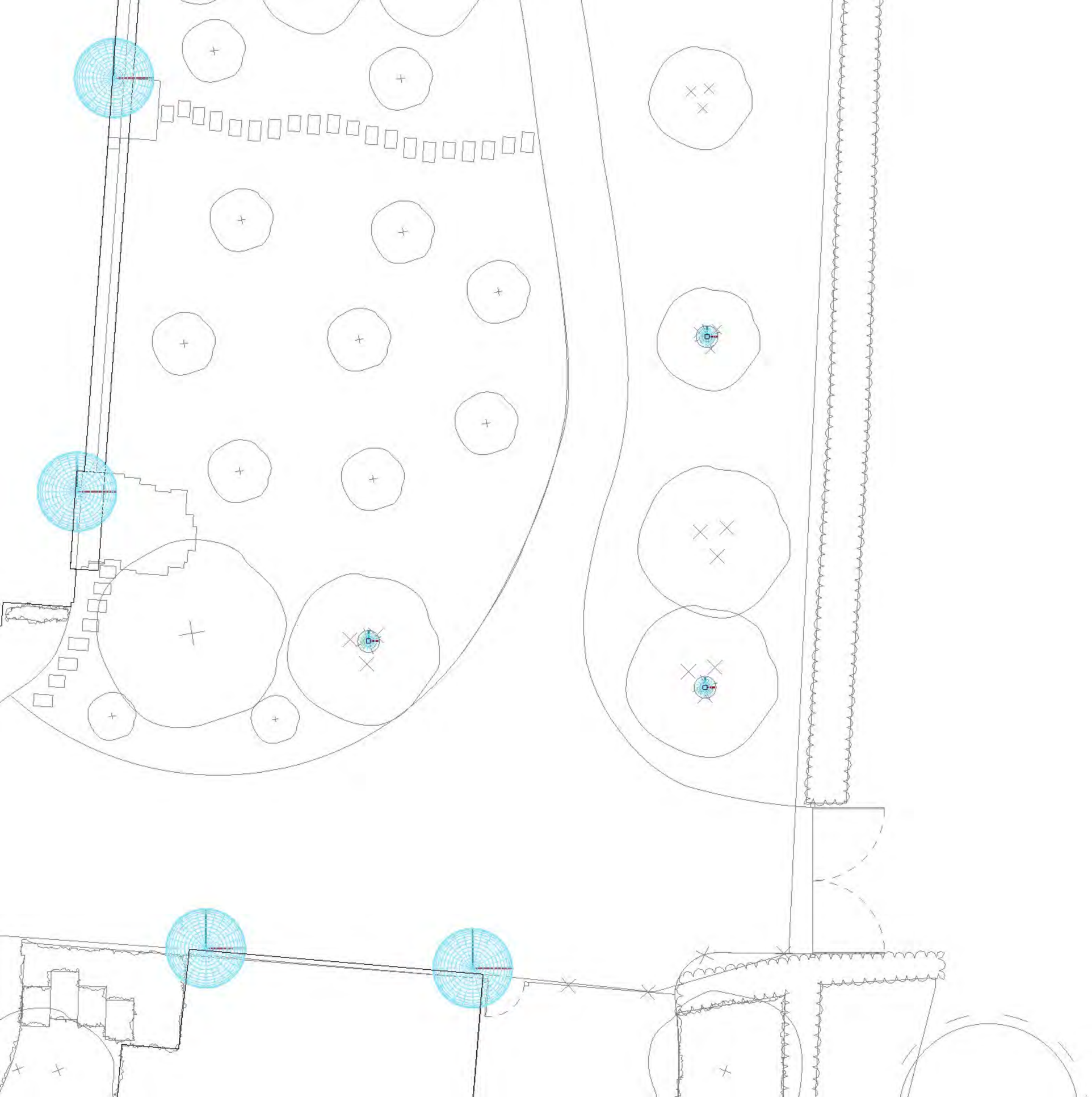
Analysis Areas 1 to 5

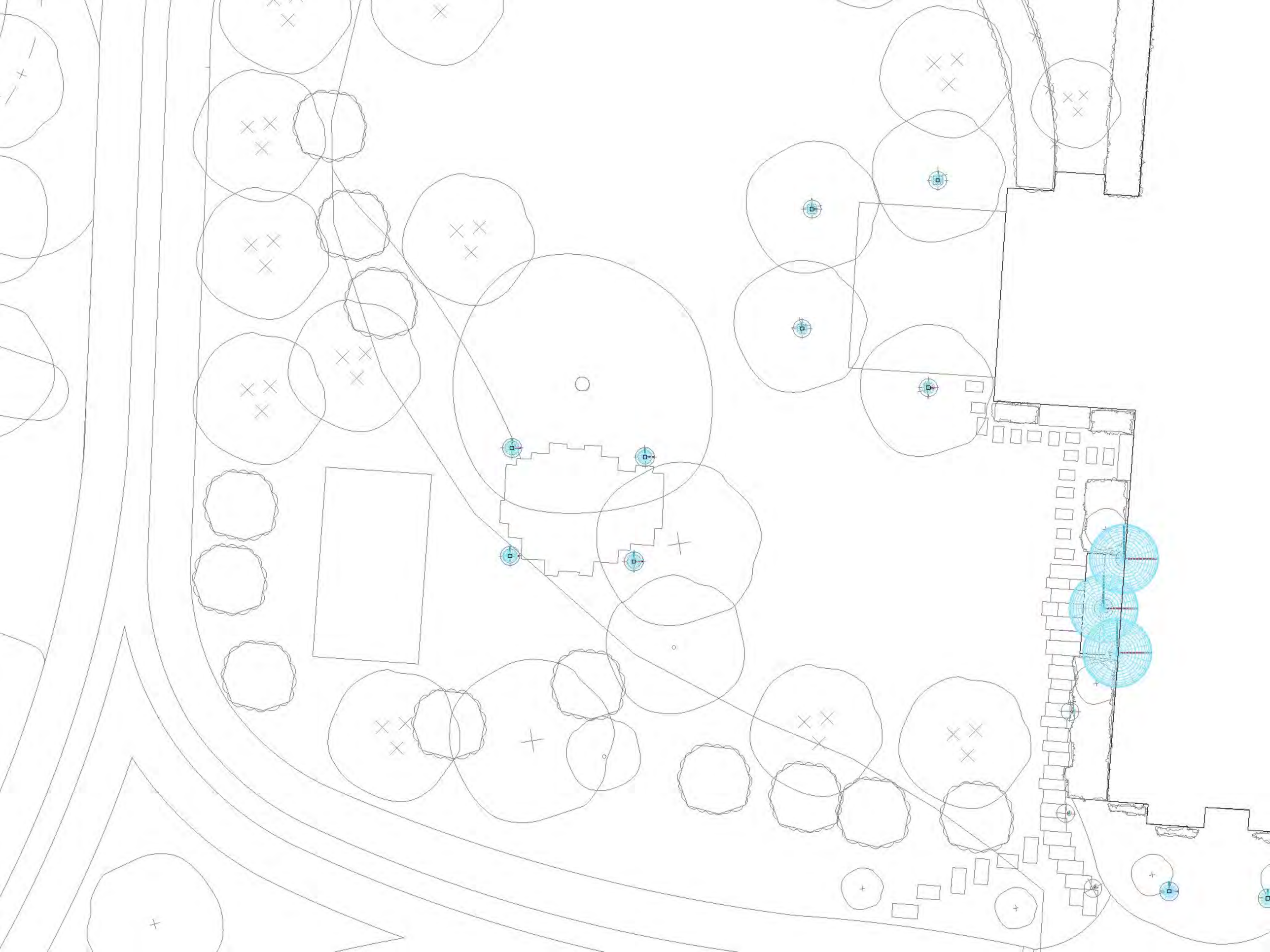


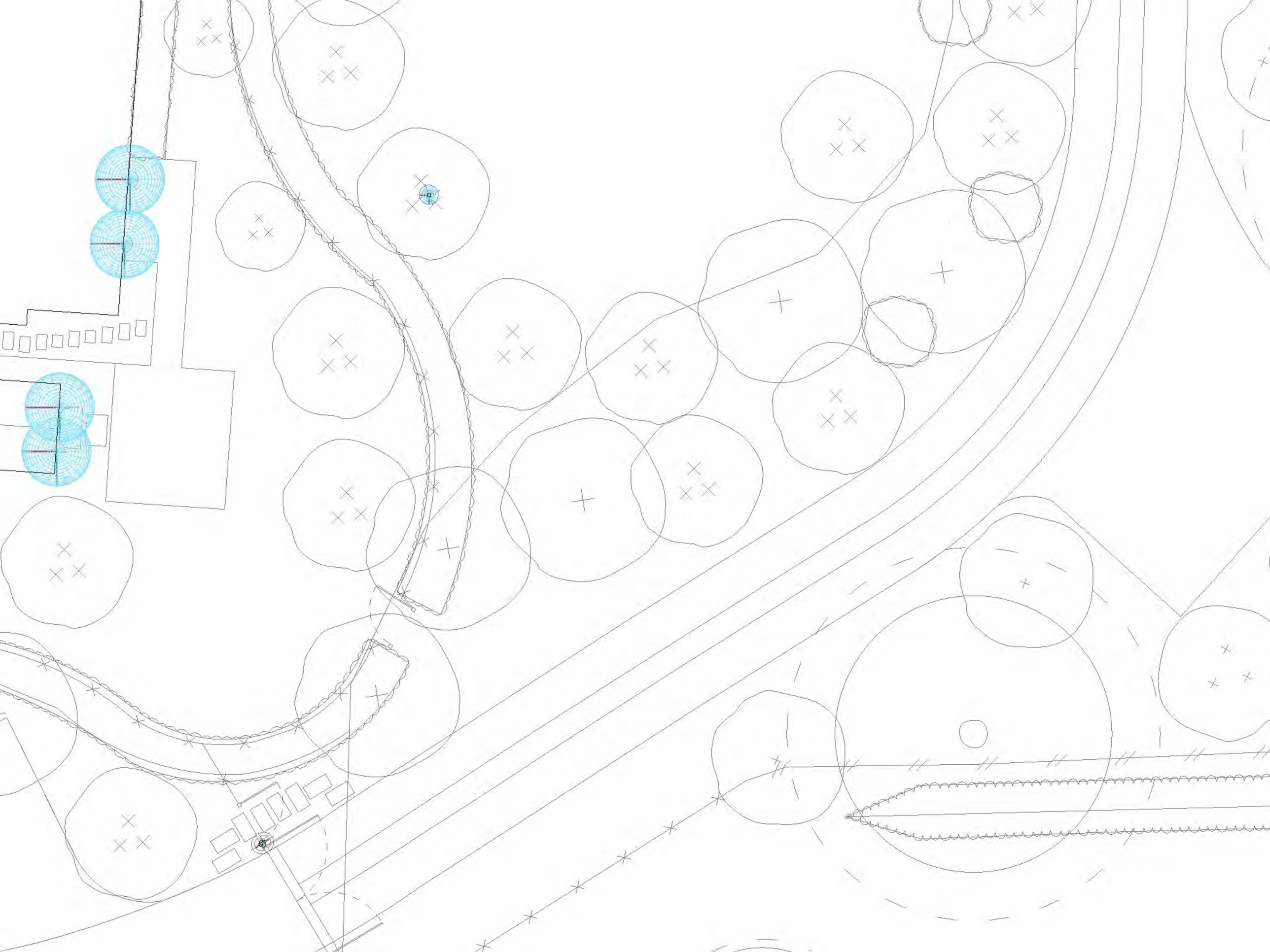














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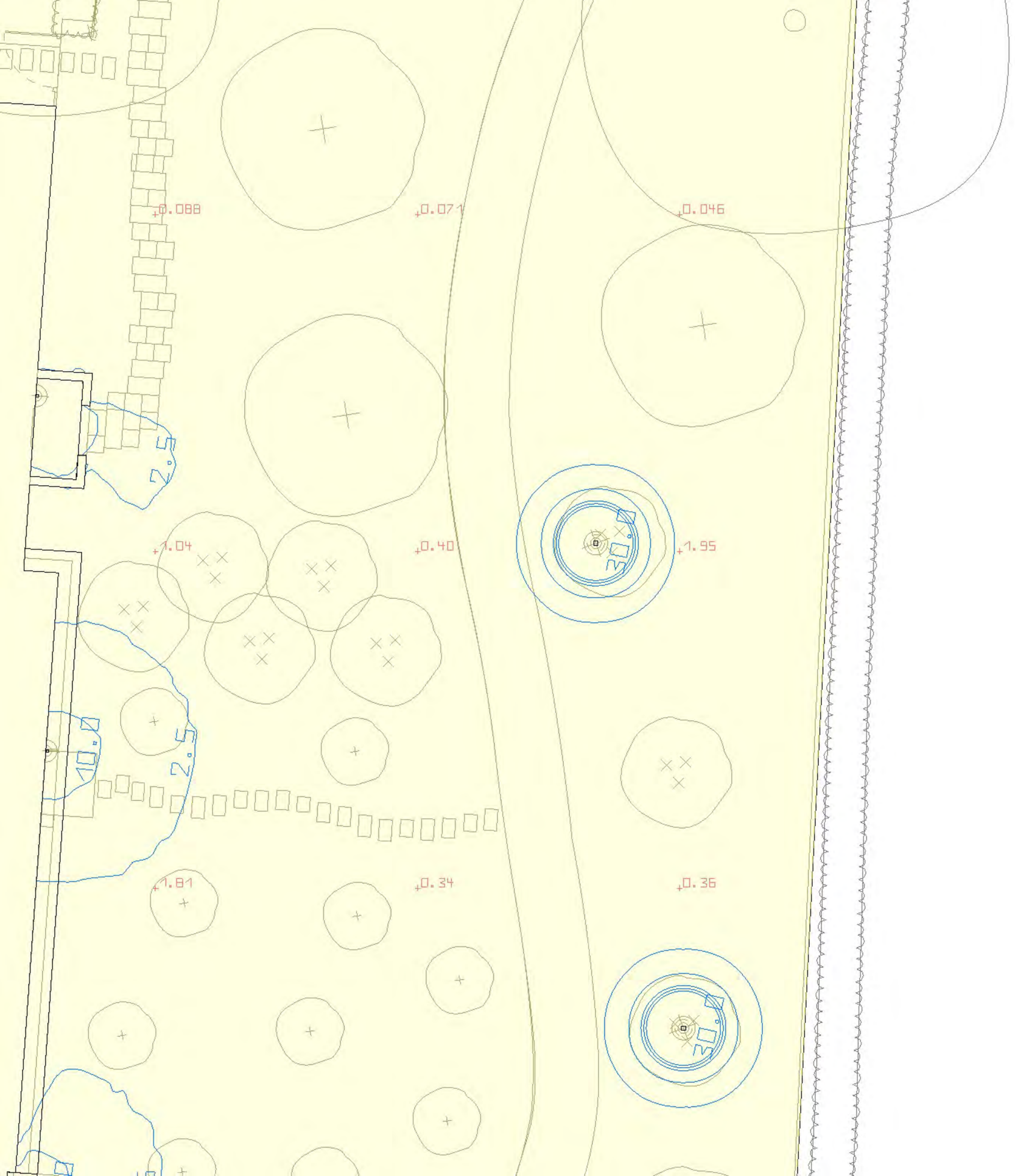

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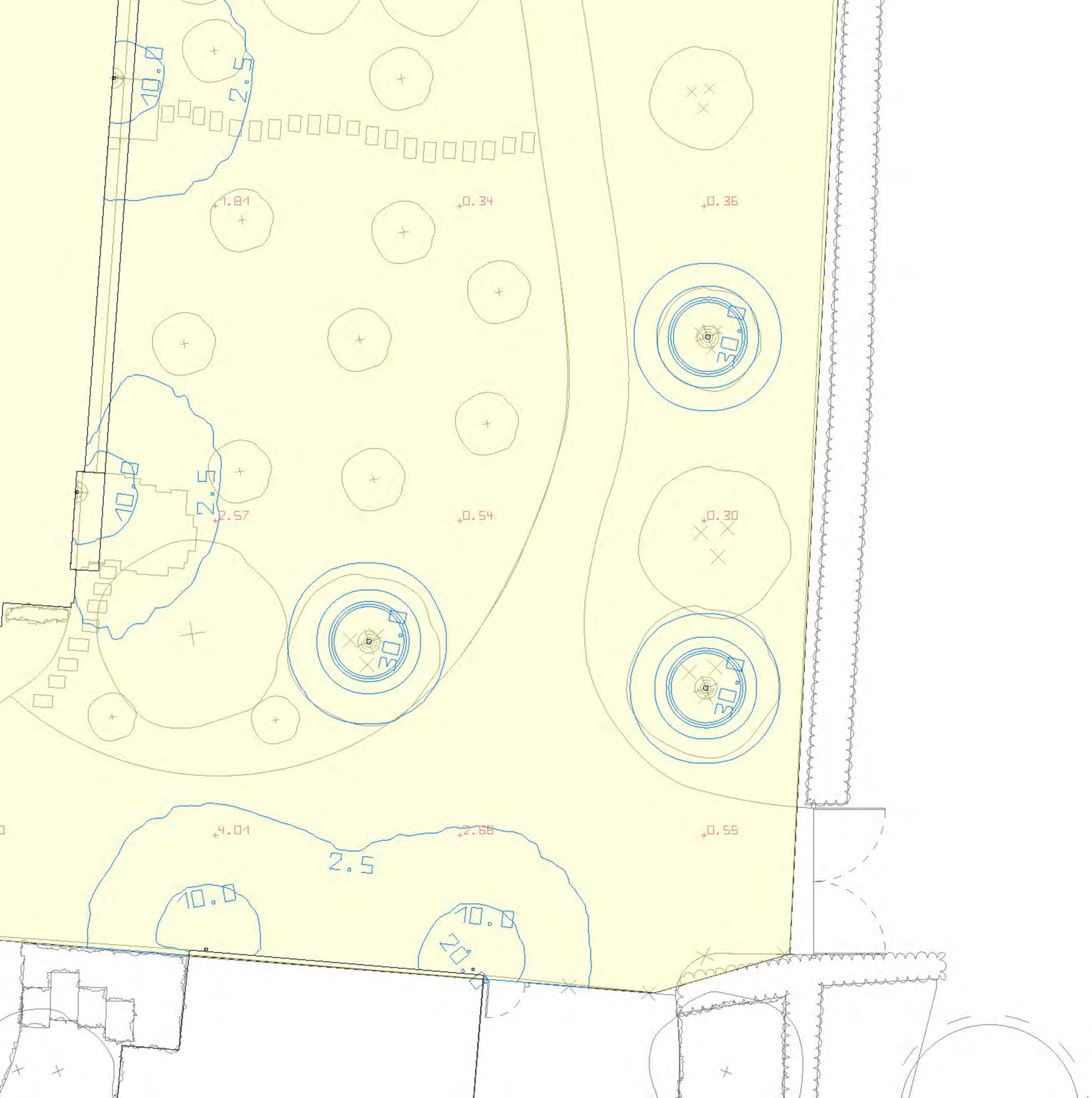
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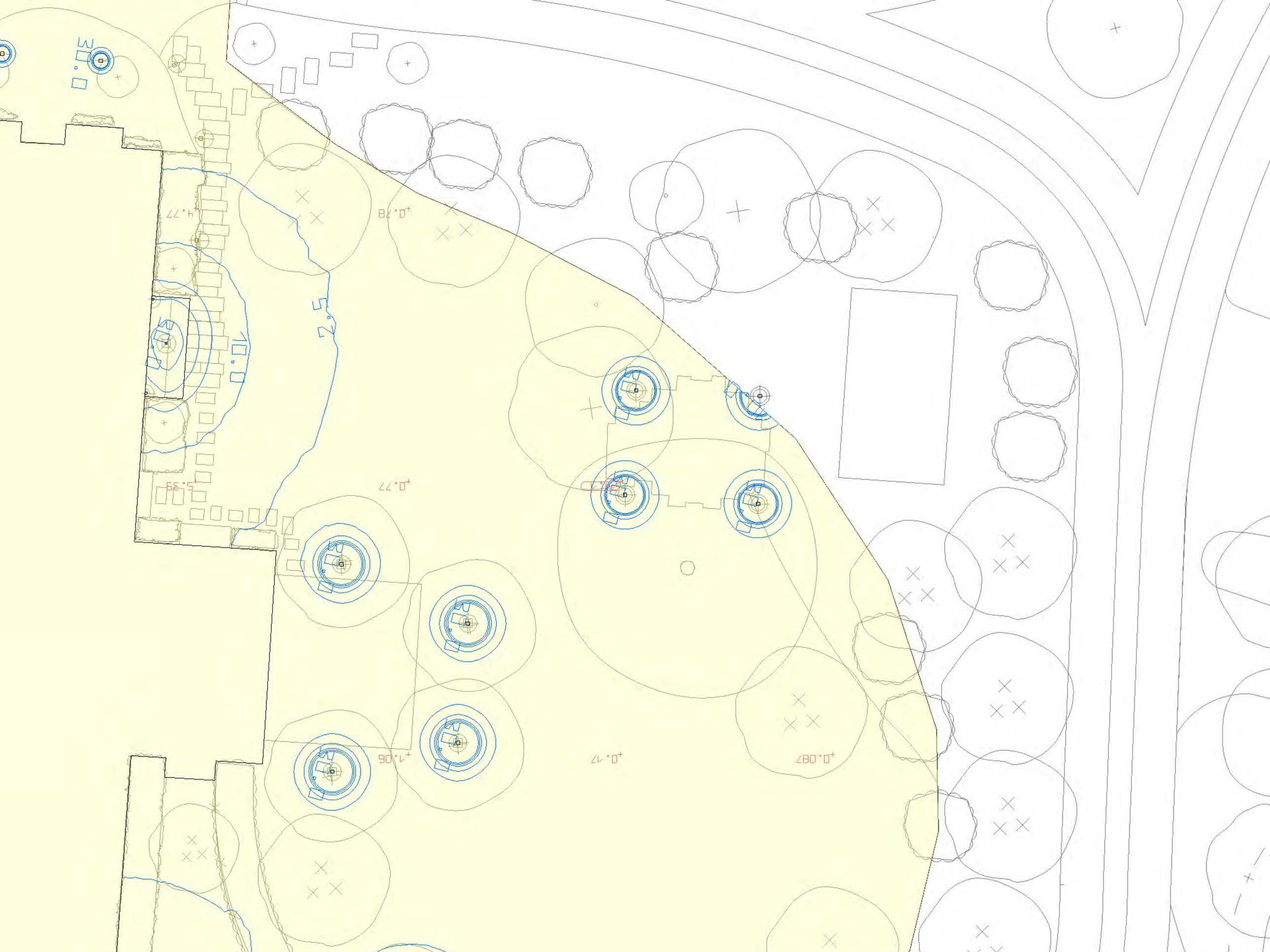
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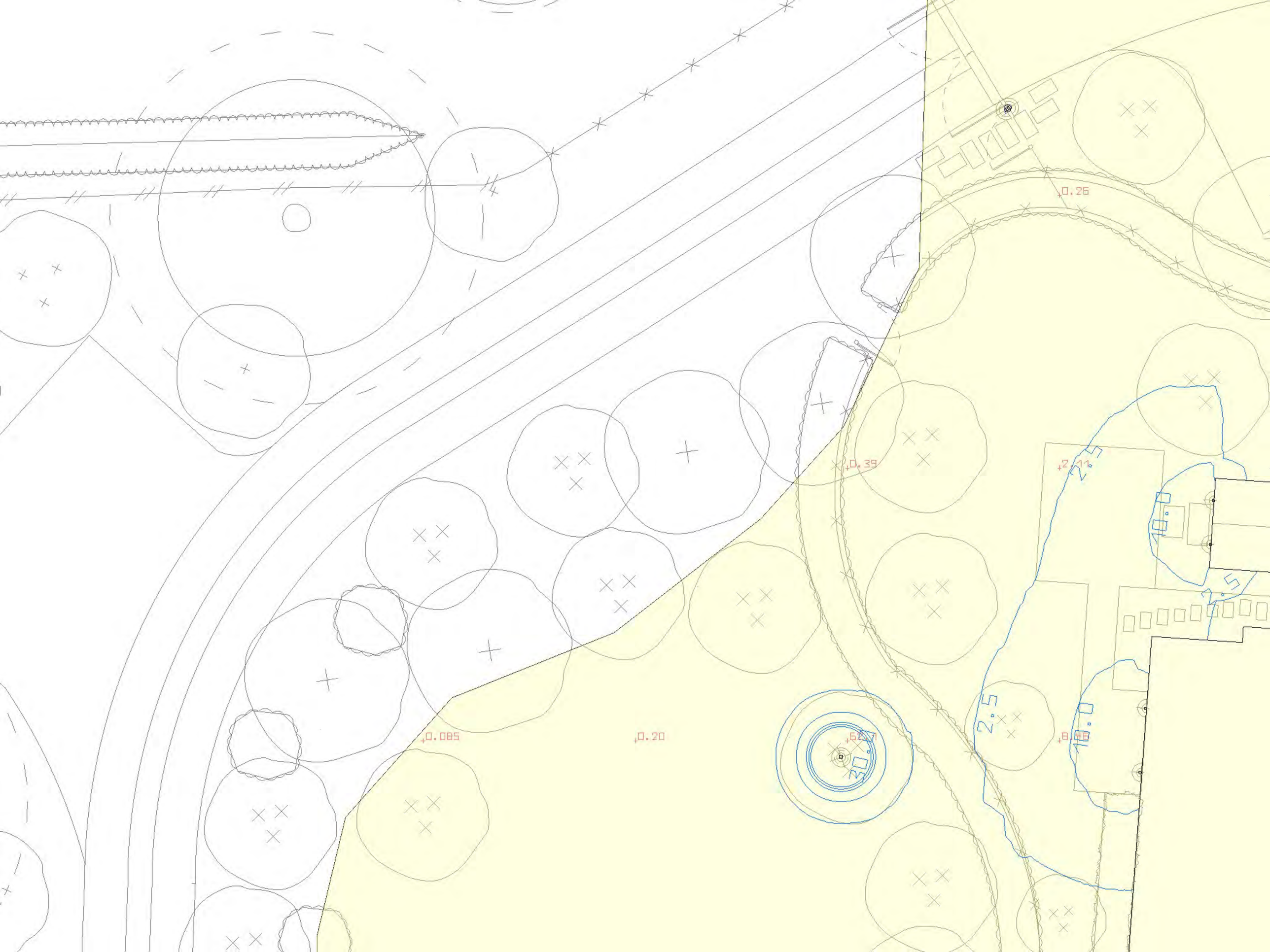

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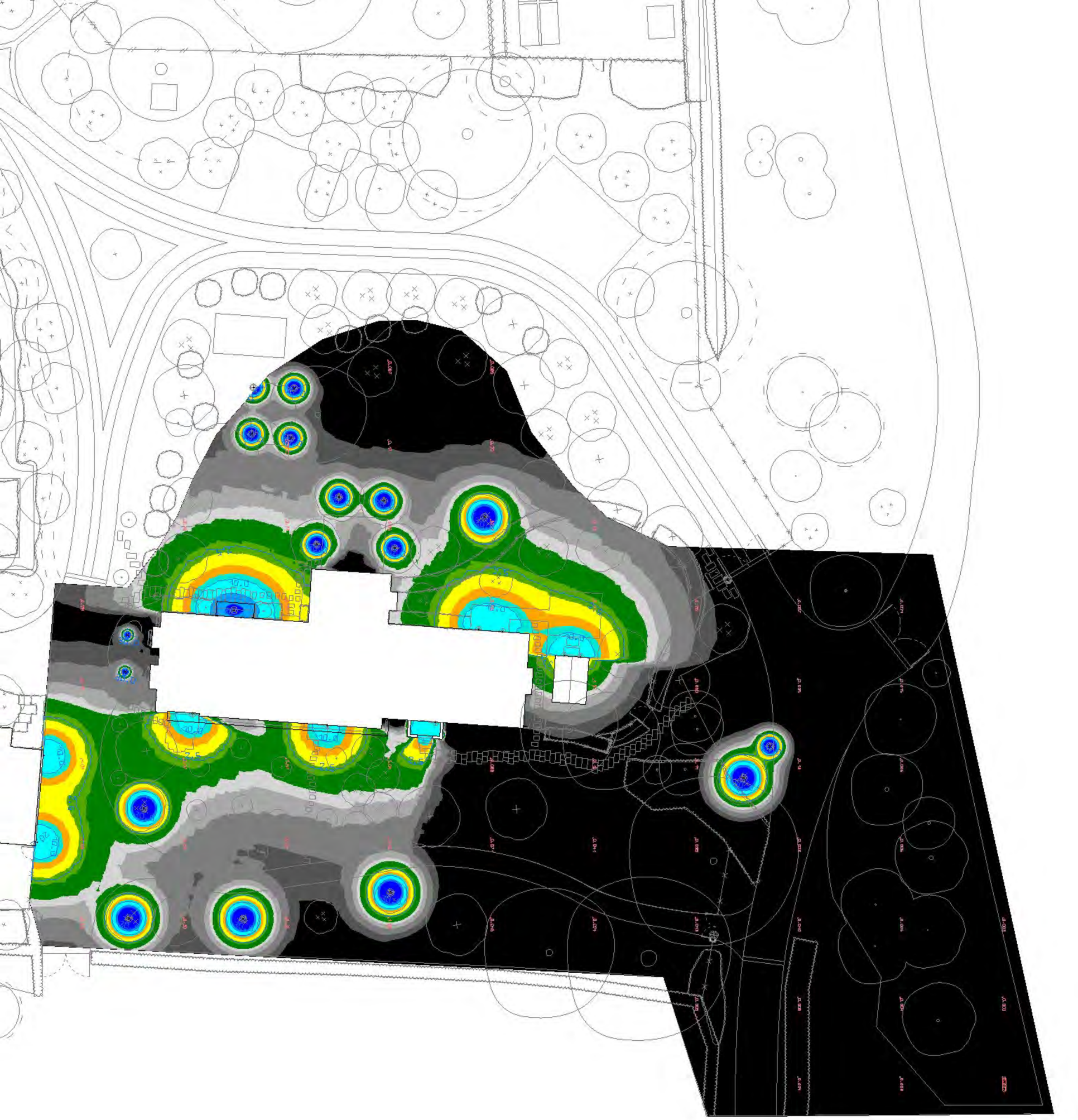

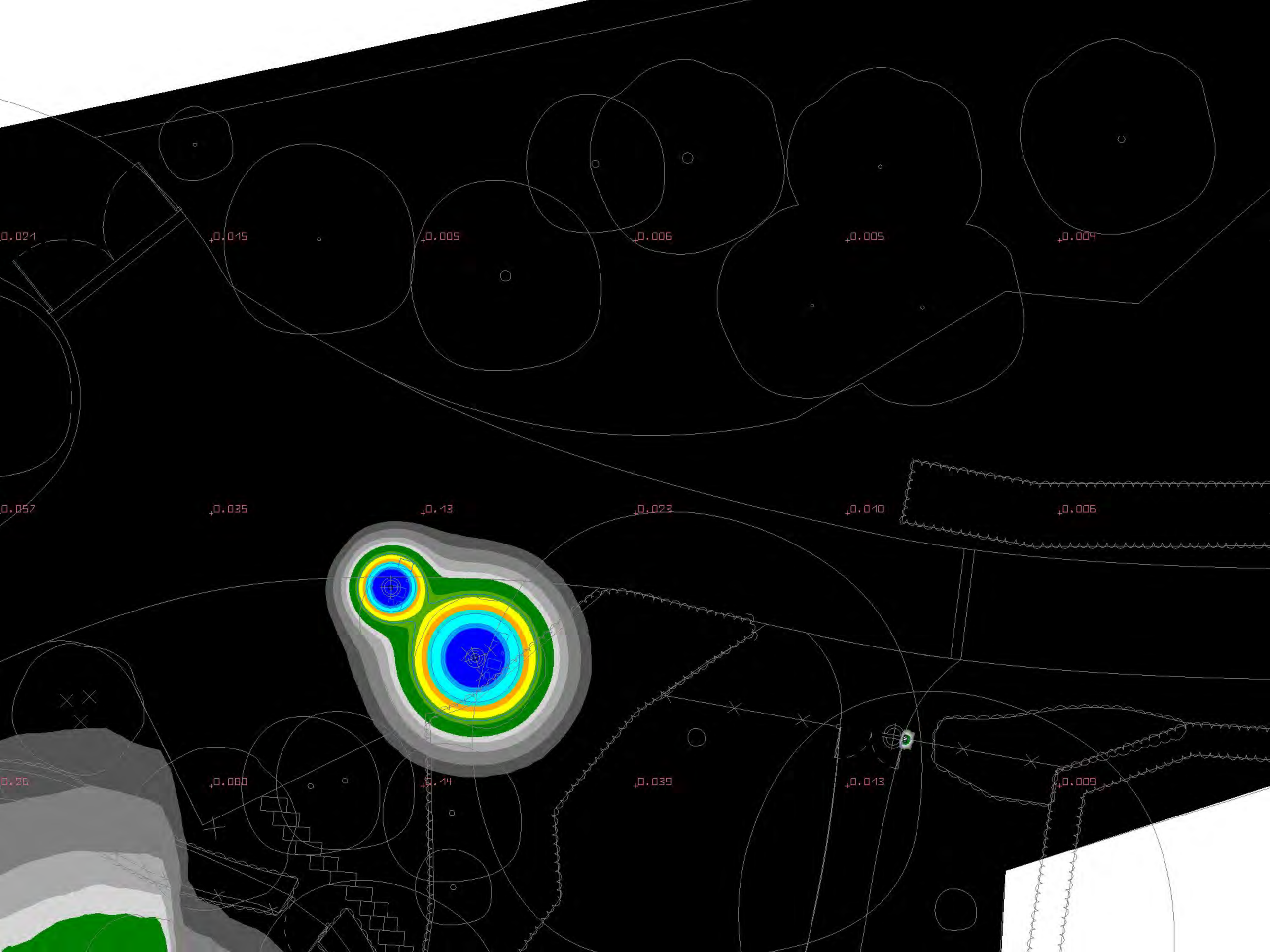
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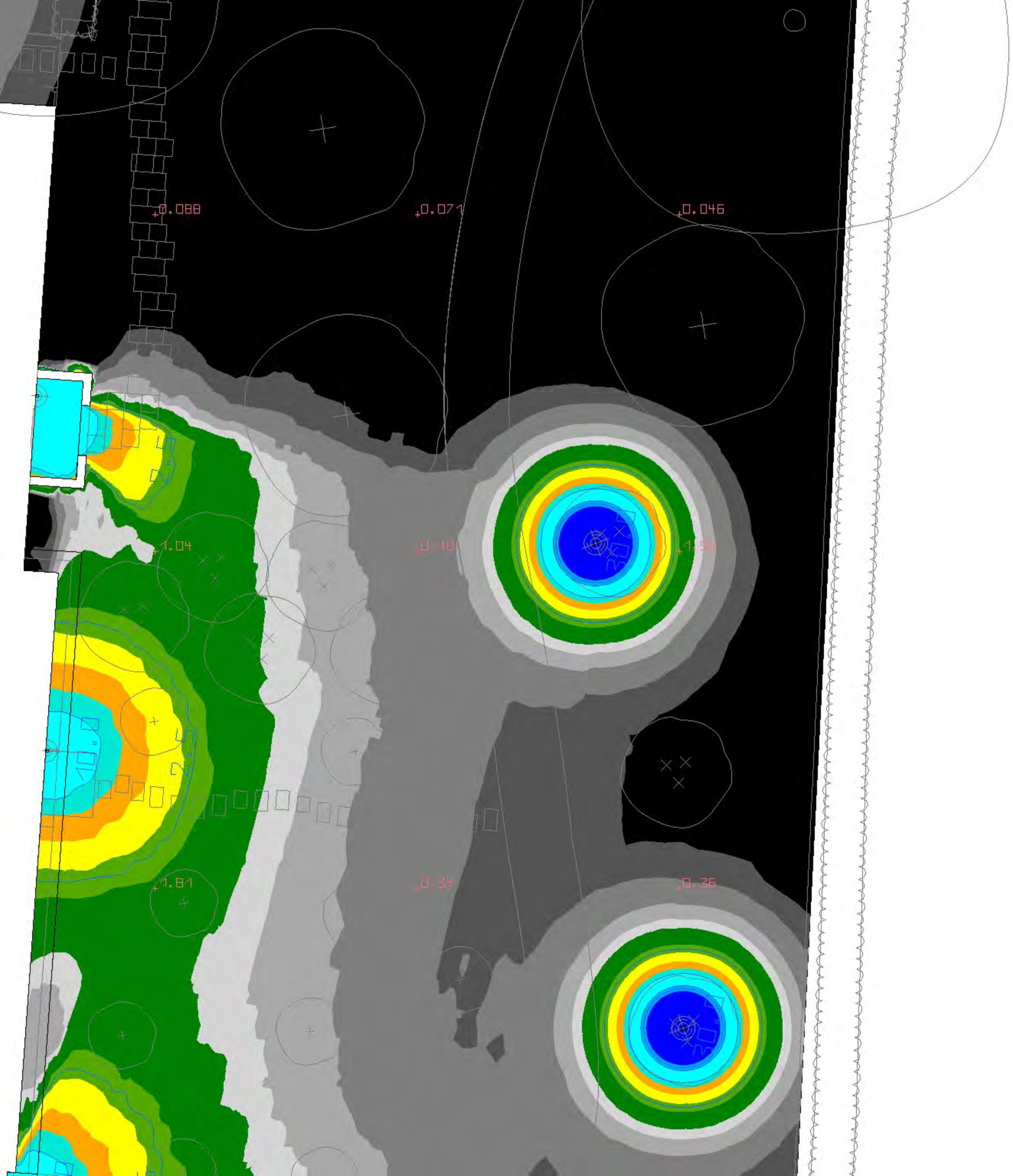
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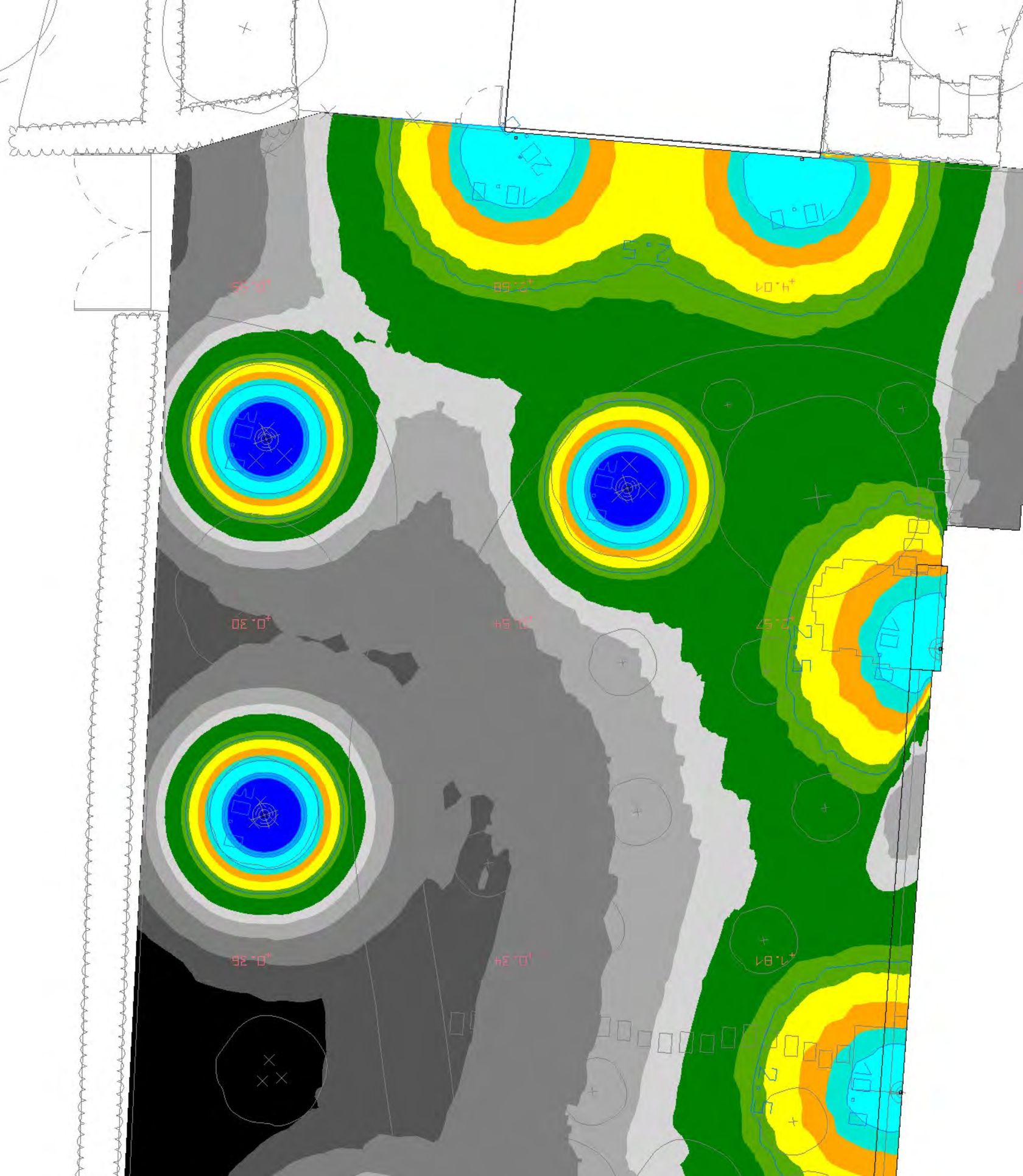
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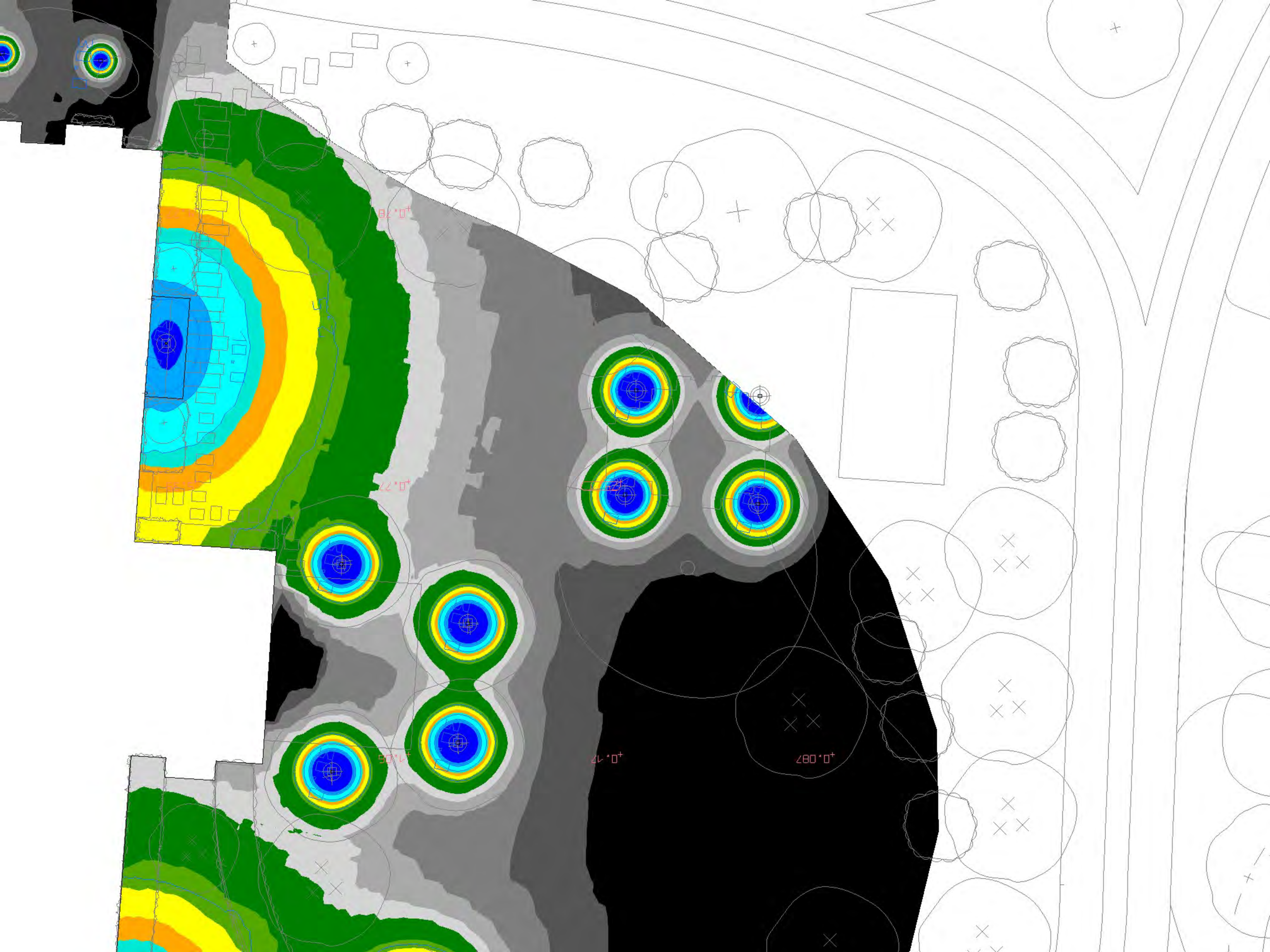

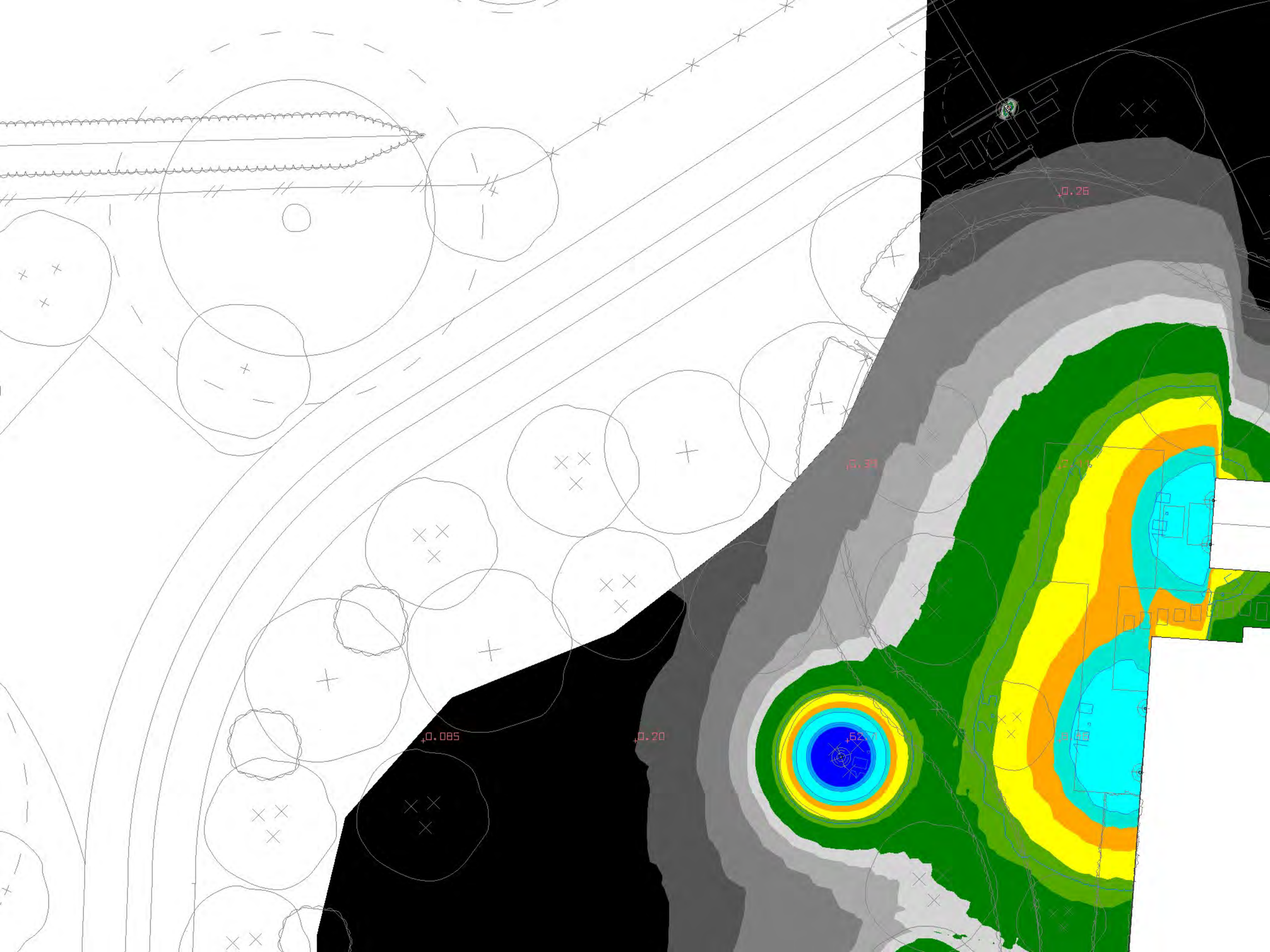
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