PUTRAJAYA LIGHTING MASTERPLAN

PERBADANAN PUTRAJAYA

September 2002

PUTRAJAYA LIGHTING MASTERPLAN

Perbadanan Putrajaya
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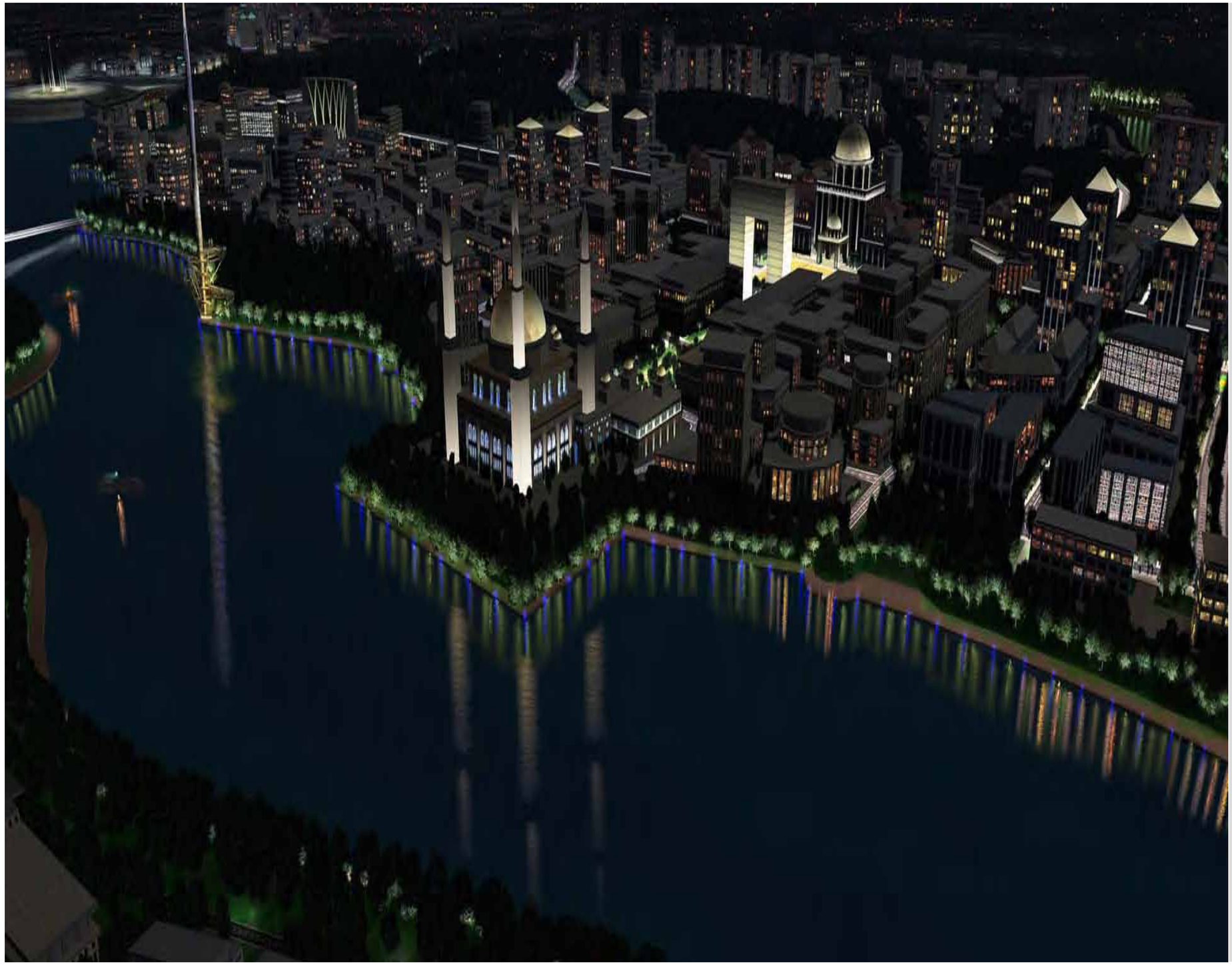
PREFACE

The purpose of this strategic Lighting Masterplan is to establish the visual and practical criteria that will ensure that the night time ambience of Putrajaya is attractive and appropriate to a city of its status and function. Additionally, the Lighting Masterplan considers the practical and functional aspects of exterior lighting and makes recommendations that will ensure that visual aesthetics are successfully balanced with the needs of public safety and amenity.

Whilst the Lighting Masterplan makes detailed recommendations in many areas, it is important that the reader respects the strategic and philosophical nature of the document. Lighting planning and design is, by its very nature, a blend of art and science and is most successful when neither one of these compromises the other. The observations, recommendations and technical guidelines in this document are therefore designed to provide a framework for design decisions. Whilst they are intended to steer the city towards a cogent night time image, they are not intended to be restrictive or unduly prescriptive and should be used constructively by those with the necessary lighting experience.

"…ensure that the night time ambience of Putrajaya is attractive and appropriate to a city of its status and function…"

"…it is important that the reader respects the strategic and philosophical nature of the document…"



Core Island by Night

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September 2001

SECTION 1 - BACKGROUND

1.1 GENERATION AND CONTEXT OF THE LIGHTING MASTERPLAN

1.1.1 General

The Lighting Masterplan (refer to drawing 1.1.1) draws on and reflects the urban design principles applied to the city to date. Urban design and lighting design objectives are similar. These include creating a sense of visual unity to the overall lit composition. The opposite of visual unity is monotony. This is relieved by the use of contrast. However, excessive use of contrast can also create its own form of monotony and therefore requires to be relieved by visual punctuation.

In planning the lighting for Putrajaya, account must be taken of the texture and colour of local materials since it is the interface between these and the light that will substantially create the required sense of unity.

The revelation of the urban massing, through the use of planned artificial lighting, has to take into account human scale and human perception. In the context of the nightscape the main urban design elements include:

- Vista & climax
- Terminal features
- Landmark & landmark buildings

The appropriate use of light can create a strong sense of enclosure; this is a factor that must be borne in mind when planning the perception of individual areas and spaces, particularly those that are subject to a high degree of usage. In these instances the visual strength of composition will come from the relationship of floor and wall planes and their appropriate lighting treatments.

The foregoing are considerations that will assist in uniting the physical city with the lighting planning that will determine its night time presentation.

1.1.2 Contextual Elements

The lighting design must develop the main themes of simplicity, unity and dignity that underpin the city's urban statement.

Limited topography indicates that the city's 'visual cognisance' by both resident and visitor will be dominated by the lake. The water creates a variety of inter-related spaces and offers the opportunity to use light to form the main element of the nightscape. The urban plan indicates the contextual use of a development of the 'Padang'/Garden City as a core generator. The importance of landscape to the plan therefore cannot be underestimated. The climate will quickly produce a mature feel to the urban backdrop and this must be considered and emphasised through well-designed landscape lighting.

The night time image of Putrajaya should emphasise these main urban generators to give immediate cognisance of the simplicity, unity and dignity that is Putrajaya. The nightscape 'postcard' image will be largely determined by the lighting design quality that is applied to the waterscape, landscape and major buildings.

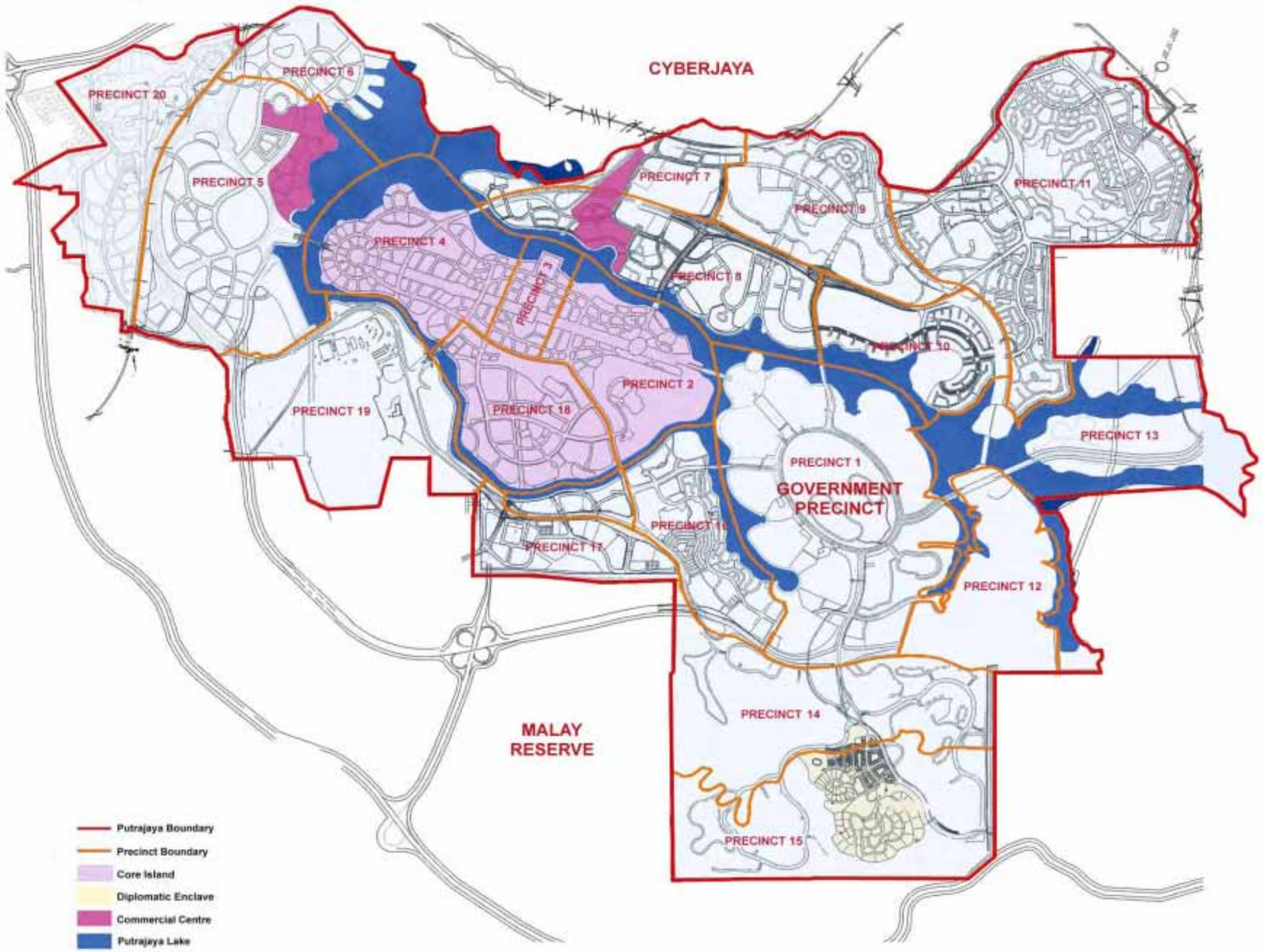
"…the opposite of visual unity is monotony…"

"…the appropriate use of light can create a strong sense of enclosure…"

"…lighting design must develop the main themes of simplicity, unity and dignity that underpin the city's urban statement…"

"…the nightscape 'postcard' image will be largely determined by the lighting design quality…"

Precinct Masterplan



Final Report
September 2002-11-27 Drawing 1.1.1

1.2 INTRODUCTION

The layout, design and quality of the city, as completed to date, express formality and monumentalism. The city's image is that of a serious place with a clearly defined function – to house the processes of government. The message is unambiguous. The Core Island Central Boulevard and its bounding buildings will become expressions of great magnitude that command attention and create a sense of immense substance and scale. This is supported and extended to the north by the Precinct 1 government buildings and to the south by the presence of the Convention Centre.

This daytime image can be extended into night time through a use of light that moves beyond the purely practical or ornamental.

In addition to fulfilling functions associated with safety, security and amenity, lighting should clearly reveal the city structure and its components. Lighting should not draw attention to itself and should not be frivolous. Terms that evoke the night time quality of the city include elegance, restraint, tranquillity and visual comfort. Strongly coloured or animated lighting will have a minor permanent role to play in Putrajaya's nightscape. However, such lighting can add an appropriate quality to temporary special or festive events.

Four existing buildings are good examples of primary visual anchors. The Prime Minister's Office, Prime Minister's Residence, Foreign Ministry and the Masjid Putra (refer to Figure 1.2.1 and 1.2.2) are indicative of the scale and magnitude of buildings yet to be built and of the importance that the lighting of these will have in shaping the image of the city at night.

Fig 1.2.1
Perdana Putra
Prime Minister Department

Fig 1.2.2
Masjid Putra

The significance and value of the lake system was, not fully evident at mid 2002. However, when the inundation programme is complete, numerous lighting opportunities will develop to express the relationship between land and water. The existence of a continuous pathway, that follows the shoreline both in the built up and the undeveloped areas, invites the use of light as a form of visual punctuation that marks the lake shore in certain areas and, literally, reflects the city at night.

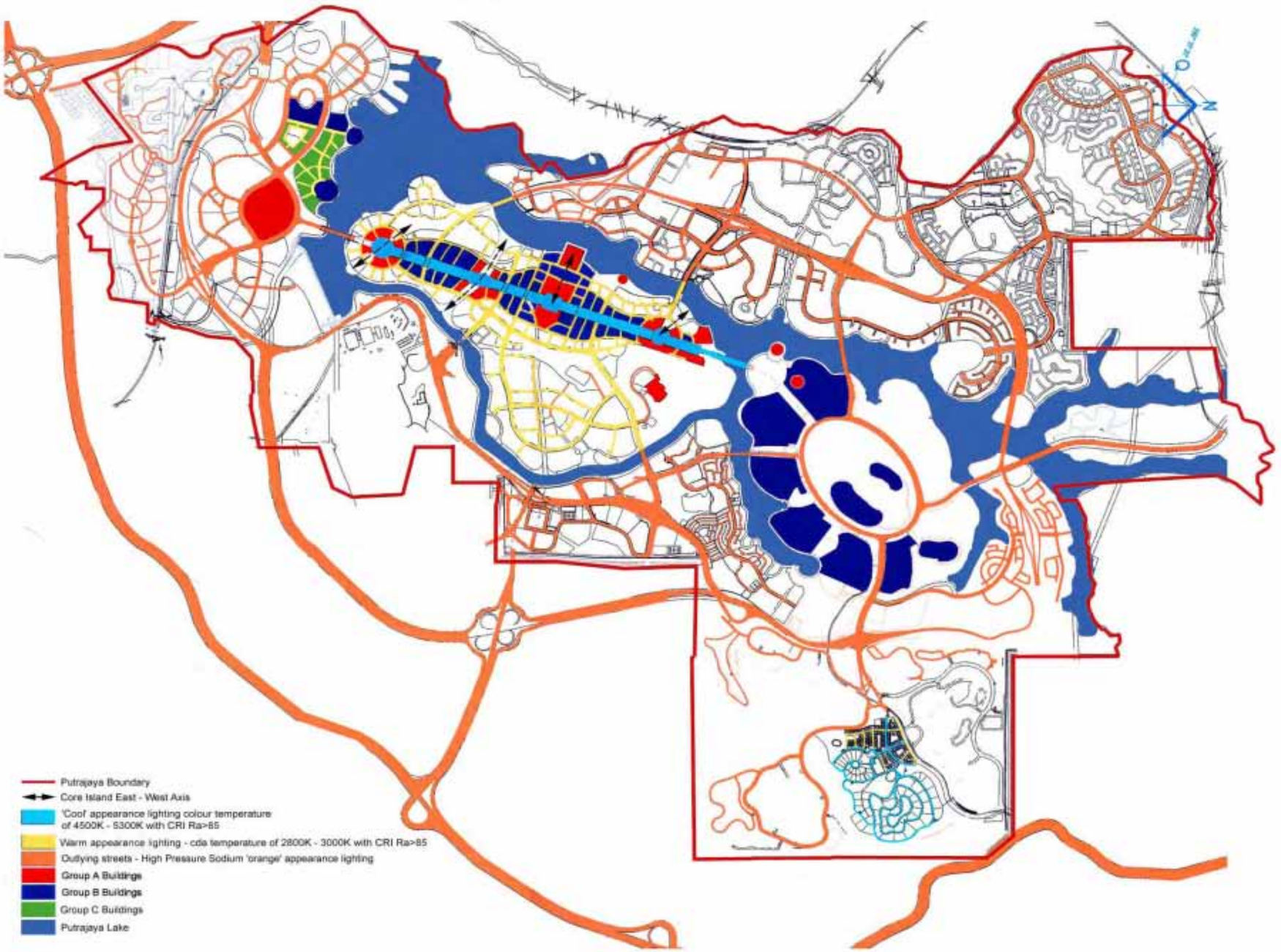
"…this daytime image can be extended into night time through a use of light that moves beyond the purely practical or ornamental…"

"…lighting should not draw attention to itself and should not be frivolous…"

"…strongly coloured or animated lighting will have a minor permanent role to play in Putrajaya's nightscape…"

"…numerous lighting opportunities will develop to express the relationship between land and water…"

Light Plan



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Drawing 1.2.1

1.3 PUTRAJAYA - THE URBAN CONTEXT

1.3.1 UDG & DUD

The Urban Design Guidelines for the city as a whole and the Detailed Urban Design for individual precincts have determined a series of urban characteristics and area functions that should be underpinned and emphasised at night through varying qualities of lighting. Additionally, the UDG and DUD documents provide analyses of the viewpoints and corridors of view that will evolve as the construction of the city develops.

Within the core island the DUD documents identify 5 main uses for individual precincts in the Core Island:

- Mixed Use Development (such as P2)
- Civic & Cultural (such as P3)
- High Intensity Commercial (such as P4)
- Sports & Recreational (such as P5)
- Residential (such as P6)
- Residential (such as P18)

Outside the Core Island subcentres have been identified which include

- Precinct 1 - Parcel Z - Commercial Development
- Precinct 5 - Festival Place
- Precinct 7 & 8 – Sub-Commercial Centre
- Precinct 11 & 18 – Neighbourhood Commercial Centre
- Precinct 14 - Diplomatic Enclave

Each of these requires a widely differing lighting response in order to emphasise their distinctive characters at night.

1.3.2 Topography

The topography of the city lends itself to the creation of nightscape vistas and distant viewpoints. The elevation of the land to the east and the south of the Core Island indicates that the potential exists for east-west through views in addition to the axial views north-south up and down the Central Boulevard and the western part of the lake.

This is an important issue since the availability of distant views establishes the opportunity to create a visual hierarchy at night. The macro view comprises a series of lit elements that are also the subject of micro or local views. The brightness of the lighting to buildings and structures is partially determined by the distance from which these are visible. Those that are viewed only locally will not benefit from higher intensities of lighting whilst those that are visible from a distance will require to be more brightly lit. A balance is recommended in terms of brightness ranges as determined by distance of visibility of key buildings and structures as well as the recommended ‘district brightness’ of a given area of the city.

“…the availability of distant views establishes the opportunity to create a visual hierarchy at night…”

“…balance is recommended in terms of brightness ranges as determined by distance of visibility of key buildings and structures as well as the recommended ‘district brightness’ of a given area…”

1.3.3 Night time visual hierarchy

An analysis suggests that the following would be an appropriate nightscape hierarchy in terms of relative brightness values with the Central Boulevard and its associated buildings becoming the key night time visual element:

- Central Boulevard
- Key buildings on Central Boulevard, Precinct 1 and Precinct 5
- Commercial buildings comprising the CBD at the southern end of the Core Island
- Bridges connecting to Core Island
- Lakeside promenades
- Secondary roads and streets
- Buildings on secondary roads and streets
- Parks
- Residential precincts

1.3.4 City Gateways

Arrival into Putrajaya is as yet **not** well defined with clear points of entry and exit other than highway signages. This supports the concept of developing 'gateways' that are distinct by day and become prominent at night through the use of light. The concept of a series of gateways is proposed, with suggested locations around the perimeter boundaries of Putrajaya. Gateways that are solely devised around the use of light, such as powerful vertical beams of light from equipment recessed within the ground, will not have the same degree of impact as those that are composed of a physical element that incorporates the innovative use of light. As the premier Garden City of Malaysia it is possible to create gateways through key landscaped elements. Accordingly, it is proposed that the physical design of gateway features be developed and complemented by appropriate lighting.

"… a series of gateways is proposed with suggested locations around the perimeter boundaries of Putrajaya…"

1.3.5 Waterways

The lake is a central component of the city's character. Its revelation at night is possibly more important than by day since it is both the city's visual anchor and guiding map. It also comprises a major proportion of the city's surface area. Its presence will be revealed at night by reflection of the lighting of surrounding buildings, roads, streets, promenades and the bridges that span it. However, there are opportunities to create further night time features that reflect the large expanse of water. Such features might include floating light sculptures, illuminated fountains and water jets or Sound and Light displays. Additionally, it is proposed that the lighting of the bridges is designed to provide a normal level of basic lighting with further lighting being brought into play for celebratory days thereby creating heightened reflections in the lake surface.

"…its presence will be revealed at night by reflection of the lighting of surrounding buildings, roads, street, promenades and the bridges …"

"…(the lake's) revelation at night is possible more important than by day since it is both the city's visual anchor and guiding map…"

1.4 APPRAISAL OF PUTRAJAYA AS CONSTRUCTED TO DATE

1.4.1 General

Putrajaya has taken the opportunity to ensure that lighting plays a highly visible role in the overall presentation of the emerging city. The majority of completed roads, buildings, structures and landscapes are lit. This has created an initial impression that there is an abundance of light (refer to Figure 1.4.1). Much of this impression is created by the fact that many of the external lighting fixtures are of a type that emit light in all directions such as 'globe' fixtures or other dispersive types of decorative lantern. This is demonstrated by Figure 1.4.2 and 1.4.3. These create a plethora of light points when viewed at a distance and frequently detract from the main object of regard such as a building façade, bridge or landscaped area. Much of the light dispersal is to the sky and adds only to night sky pollution.

There is a fine balance between creating a visual sense of night time liveliness and creating a scene that lacks clarity and legibility. The existing lighting of individual projects appears to have been designed and installed on a unilateral basis i.e. each project has been lit without regard to the contribution it will make to the complete nightscape. The overall result is the genesis of the type of night time visual disorder that characterises most existing urban environments throughout the world.

Fig 1.4.1
Abundance of Light

Fig 1.4.2
Day view of globe fixtures at Botanic Garden Carpark

Fig 1.4.3
Overall view of Botanic Garden carpark with globe fixtures which contribute to night sky pollution and reduced night ambience

"…Putrajaya has taken the opportunity to ensure that lighting plays a highly visible role in the overall presentation of the emerging city…"

"…There is a fine balance between creating a visual sense of night time liveliness and creating a scene that lacks clarity and legibility…"

1.4.2 Road & Street Lighting

The lighting of the major roads and streets is almost universally based on the use of high-pressure sodium light sources of a warm appearance with an orange hue. Some of the existing street lighting installed at Putrajaya is shown in Figure 1.4.4 and 1.4.5. The lighting levels at the road surface appear to be in general accordance with the standards that are normal for the various road categories. It is however noted that the uniformity of the lighting at the surface of the major roads in Precinct 1 appears to be compromised by the design of the decorative enclosure of the luminaire. This appears to slightly restrict the lateral distribution of the light from the luminaire with a resultant reduction in uniformity of light distribution at road surface level.

Currently the Standards and Codes of Practice for road and street lighting commonly quoted by the Putrajaya local authority is British Standards (BS) 5489. A limited survey has identified that the installed systems, in some instance, fail to provide the required level of uniformity. It is recommended that the adoption of the CIE (Commission Internationale de l'Éclairage) standard should be adopted as the standard for Putrajaya road and street lighting design.

A number of key access and trunk roads are designated as 'Protocol Roads'. A form of lighting different from that used on other roads should identify these. This could take the form of increased lighting levels or a lighting provision based on a light source other than high-pressure sodium.

See Appendix A for the details of a survey of the road and street lighting as existing in late 2001.

Fig 1.4.4
Existing Street Lighting

Fig 1.4.5
Existing Street Lighting

"…recommended that the adoption of the CIE (Commission International de L'Eclarage) standard should be adopted as the standard for Putrajaya…"

"…Protocal roads. A form of lighting different from that used on other roads should identify these…"

1.4.3 Building And Structure Lighting

The overriding impression is that the existing lighting of buildings merges with that of the surrounding roads and streets. In many instances, the same light source is used to light both elements and this results in a lost opportunity to distinguish and contrast the buildings from their surroundings. A major example of this is the Prime Minister's Office; the elevations are illuminated by high-pressure sodium light sources with only the coolly lit roofs becoming a dominant feature.

The existing illumination of most buildings is based on the use of high-pressure sodium light sources. This is an unfortunate development and a major policy recommendation is that the lighting of building elevations should be contrasted with that of the lighting of the surrounding roads and streets. This recommendation will also raise the question of whether the existing lighting of some of the most important buildings should be reconsidered.

1.4.4 Night Sky Light Pollution

A number of examples of night sky light pollution are evident. A high proportion of the lighting to the roofs and the dome of the Prime Minister's Office is clearly seen (from the shore of Precinct 8) to ' miss' the targeted surfaces and project upwards into the sky, illustrated in Figure 1.4.6. Similar examples can be seen in the lighting of the ministry buildings in Parcels C and D and the Masjid Putra.

The lighting of the Dataran Putra is based on a series of decorative columns, located in a circle, each with four road lighting lanterns directed at an upward angle of some 45° to the horizontal.

The decision to tilt the lanterns upward has been partially motivated by the need to project the light over the greatest possible distance. This lighting method results in an exceptionally high level of glare, particularly to those who are viewing either the Masjid Putra or the Prime Minister's Office at a distance, as illustrated in Figure 1.4.7. Additionally, since a major proportion of light is not directed downward, the contribution to sky glow or night sky light pollution is substantial.

Fig 1.4.6
Prime Minister Office
- night sky pollution

Fig 1.4.7
Dataran Putra

"…The overriding impression is that the existing lighting of buildings merges with that of the surrounding roads and streets…"

"…a major policy recommendation is that the lighting of building elevations should be contrasted with that of the lighting of the surrounding roads and streets…"

"…This lighting method results in an exceptionally high level of glare…"

"…The view, on a hazy night, of the partially completed northern end of the city from the roadway system at the south end demonstrates the degree of sky glow that already exists…"

A further small, but significant, example of glare and the associated reduction in visual comfort relates to the Masjid Putra minaret at the top of which there appears to be a powerful light source directed to the north west. The glare created by this unshielded source is a good example of how only one misdirected light source can detract substantially from the night time view of a building and its surroundings.

The view, on a hazy night, of the partially completed northern end of the city from the roadway system at the south end demonstrates the degree of sky glow that already exists. Inevitably some of this is by reflection but most of it emanates from inaccurate building and structure lighting and roadway lighting that directs part of its light above the horizontal plane. An additional and notable contribution to both the sky glow as well as the lack of visual legibility relates to the widespread use of globe lights mounted in many locations including perimeter walls and lake edge situations.

2.1 LIGHTING POLICIES

In order to overcome the problems that have been identified with aspects of the existing lighting in Putrajaya and to prevent a repetition of these in the future, a number of foundational lighting policies have been drawn up. The following 9 lighting policies are the foundations that enable Putrajaya to develop a nightscape that is cogent, attractive, environmentally successful and economic. Beyond purely visual considerations, the policies also include those that deal with the establishment of the necessary personnel structure and lighting design vetting procedures to ensure that the visual objectives are achieved and sustained.

2.1.1 Lighting Policies

POLICY 1: *Distinguish the Central Boulevard from all surrounding roads and streets on the Core Island and most other roads and streets throughout Putrajaya through the use of a distinct road lighting character. Limit this policy to situations where the use of differing colour values of 'white' light are used to distinguish specific areas e.g. the Chancery area within the Diplomatic Enclave.*

POLICY 2: *Limit the use of primary and saturated colour for the lighting of public and private buildings and structures throughout Putrajaya. Any such lighting should only be operated during state and/or festive occasions.*

POLICY 3: *Establish lit Gateways to the main entrances into Putrajaya from perimeter roadway system.*

POLICY 4: *Engage the necessary personnel to secure the comprehensive implementation of the lighting objectives of the Lighting Masterplan within Perbadanan Putrajaya.*

POLICY 5: *Ensure that Perbadanan Putrajaya maintains operational control of lighting throughout the city including lighting to roads and streets and public buildings, structures, landscapes and waterscapes. Additionally, establish a system to encourage the owners of private buildings to participate in the programme of external lighting.*

POLICY 6: *Extend the approvals process to embrace the requirement that all external lighting be submitted as a partial or separate approval application.*

POLICY 7: *Minimise night sky light pollution by requiring good lighting design practice, appropriate equipment specification and concise aiming of installed lighting.*

POLICY 8: *Establish maximum limits on the luminance of internally and externally illuminated advertising and signage.*

POLICY 9: *In residential areas street lighting columns should be of a height that is sympathetic to the scale of adjacent buildings but should not under any circumstances higher than the height of such buildings.*

Central Boulevard Looking South From Dataran Wawasan

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Figure 2.1.1

SECTION 2 – LIGHTING POLICIES

POLICY 1:

Distinguish the Central Boulevard from all surrounding roads and streets on the Core Island and most other roads and streets throughout Putrajaya through the use of a distinct road lighting character. Limit this policy to situations where the use of differing colour values of 'white' light are used to distinguish specific areas e.g. the Chancery area within the Diplomatic Enclave and the squares that mark the centre of regional residential areas.

Policy Objectives:

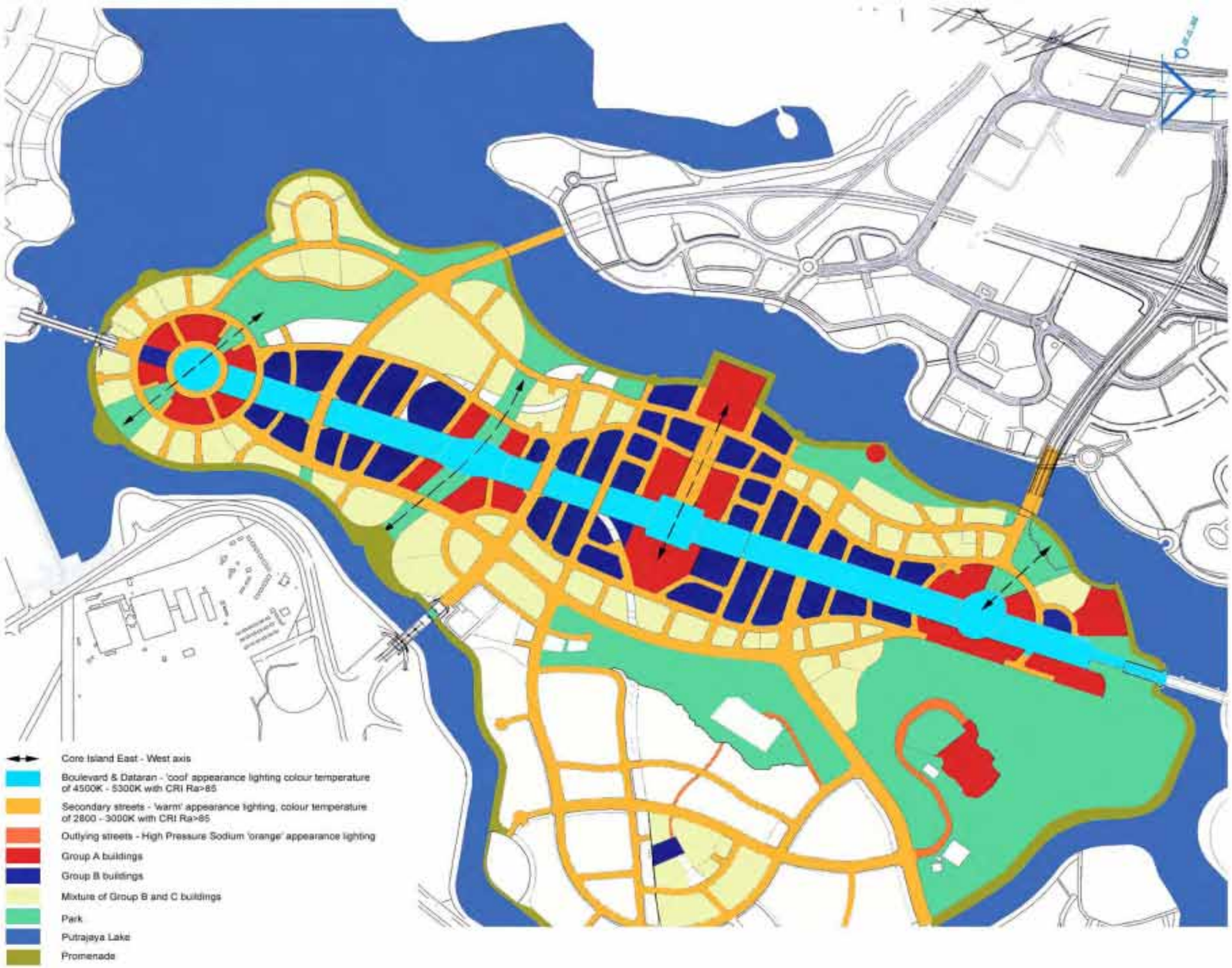
- Accentuate the special function of the Boulevard as a ceremonial route and venue for national celebration.
- Distinguish the night time experience of this key axial route from that of other roads.
- Use the powerful tool of 'white' light colour differentials to accentuate key areas outside the Core Island. This is illustrated in Drawing 2.1.1 and Figure 2.1.2.

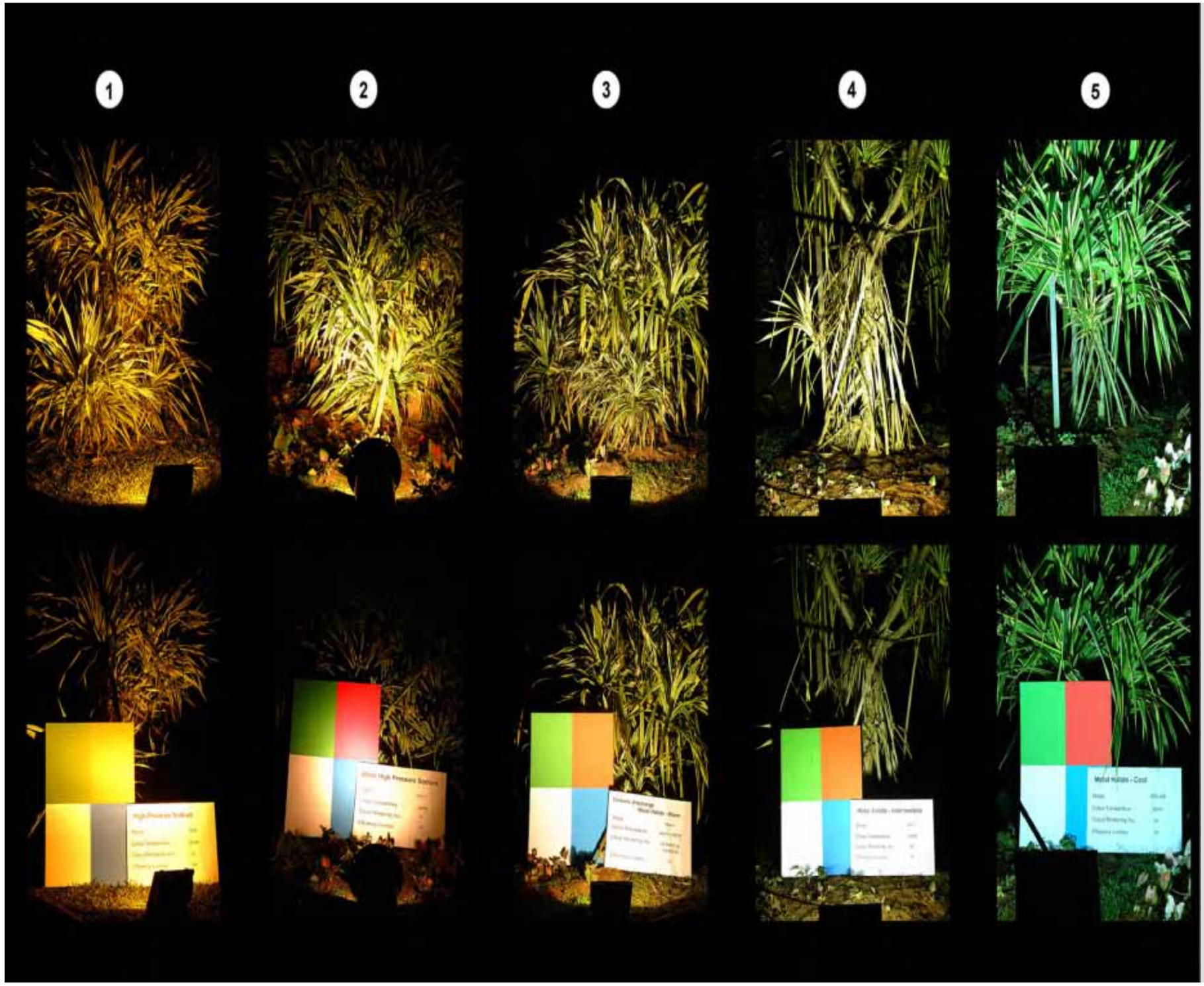
The Core Island lighting policy reinforces the objective of defining the Boulevard as one continuous open space that runs from Precinct 1 through Precincts 2 to 4 of the Core Island terminating at the Convention Centre in Precinct 5. Whilst the Boulevard passes through precincts of varying character, the lighting character of the road and adjacent pedestrian zone remains consistent, thereby establishing a sense of unity at night. Along the secondary axes that are characterised by more informal activities, an associated lighting quality is created to characterise particular areas and precincts.

Implementation Guideline:

See Section 3 - Design Guidelines for Individual Elements - Core Island Lighting Design Approach - Boulevard and Surrounding Buildings.

Hierachy of Boulevard Buildings





Demonstration of Colour Temperature Characteristics

1. Model – High Pressure Sodium (SON)
   Colour Temperature – 2000 Kelvin
   Colour Rendering (Ra) - 23
   Efficiency (lm/wwatt) - 120

2. Model – White High Presure Sodium (SON-T)
   Colour Temperature -2500 Kelvin
   Colour Rendering (Ra) -85
   Efficiency(lm/wwatt) -49

3. Model – Ceramic Discharge Metal Halide (CDM-T)
   Colour Temperature - 3000 or 4200 Kelvin
   Colour Rendering (Ra) - 81-85 (830) or 92-96 (942)
   Efficiency (lm/watt) - 95

4. Model – Metal Halide Intermediate (HPI-T)
   Colour Temperature -4300 Kelvin
   Colour Rendering (Ra) - 65
   Efficiency (lm/watt) - 95

5. Model- Metal Halide Cool (KRC-400)
   Colour Temperatre - 6000 Kelvin
   Colour Rendering (Ra) - 90
   Efficiency (lm/watt) - 62

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Drawing 2.1.1

POLICY 2:

Limit the use of primary and saturated colour for the lighting of public and private buildings and structure throughout Putrajaya.
Any such lighting should only be operated during state and/or festive occasions.

Limit the use of primary and saturated colour for the lighting of public and private buildings and structures throughout Putrajaya.

Policy Objectives:

To avoid the following undesirable visual responses:

1. Intense or saturated colour draws the eye and eclipses other aspects of what would otherwise be a well-balanced and perhaps subtle rendering of the building or structure.
2. The use of coloured light overwhelms the natural colour of the materials used in the architectural expression of the building and imposes a very different set of visual values from those originated by the architect.
3. The permanent presence of colour soon tires the eye of the beholder. The surprise factor wears thin and there is no other visual trick available to play, especially during festive occasions.
4. The maintenance of colour filters (where these are used to achieve a fixed saturated colour) adds a further burden to the demands of lighting maintenance in general. Missing or broken filters become extremely conspicuous.

Whilst the use of dense colour is not advocated on a permanent basis, it is recognised that coloured light is a valuable component in creating a sense of occasion and festivity. Examples of appropriate and inappropriate use of saturated colours to illuminate building are illustrated in Figure 2.1.3 and 2.1.4.

Implementation Guideline:

See Section 3 - Design Guidelines for Individual Elements - Festive Lighting

Saturated Colour
Appropiate Usage

1. Composition of coloured lighting scheme has been well thought through, and focal point been highlighted with contrasting coloured light. Temporary installation for light and sound festival.

2. Coloured light enhances architectural form of building, and creates calm serene night time image.
(Note colonnade lit with blue light, as per proposed festive lighting scene in Putrajaya Lighting Masterplan)

3. Lighting scheme is installed within building. Colour of façade materials unaffected by lighting.

4. Again, light fittings are resticted to the internal of the building, so materiality of architecture is unaffected by coloured light. Contrasting white light highlights roofline feature, enhancing architectural statement.

5. Coloured ligt utilised as advertising for upmarket hotel. Normal scene utilises white light. At certain times of day/for festive days lighting 'show' is run. Permanent 'temporary' installation.

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Drawing 2.1.1

Saturated Colour
Inappropriate Usage

1. Sources creates point of glare. Choice of colour shows lack of sensitivity in urban situation.

2. Form of building os distorted by prominence of colour. Use of colour overwhelms natural colour of material.

3. Spotlights have been utilised to project colour onto façade of building, creating a lack ofuniformity.Eye is drwan to the spots of colour,resulting in the architectural legibility of the building being lost.

4. Lighting scheme shows lack of composition in terms of choice of colour. No building hierarchy set up so no one building is focus of festive scene.

5. Coloured lighting inappropiate inappropiate in historic and ecclesiastical situation. Natural colour of the building material is overwhelmed.

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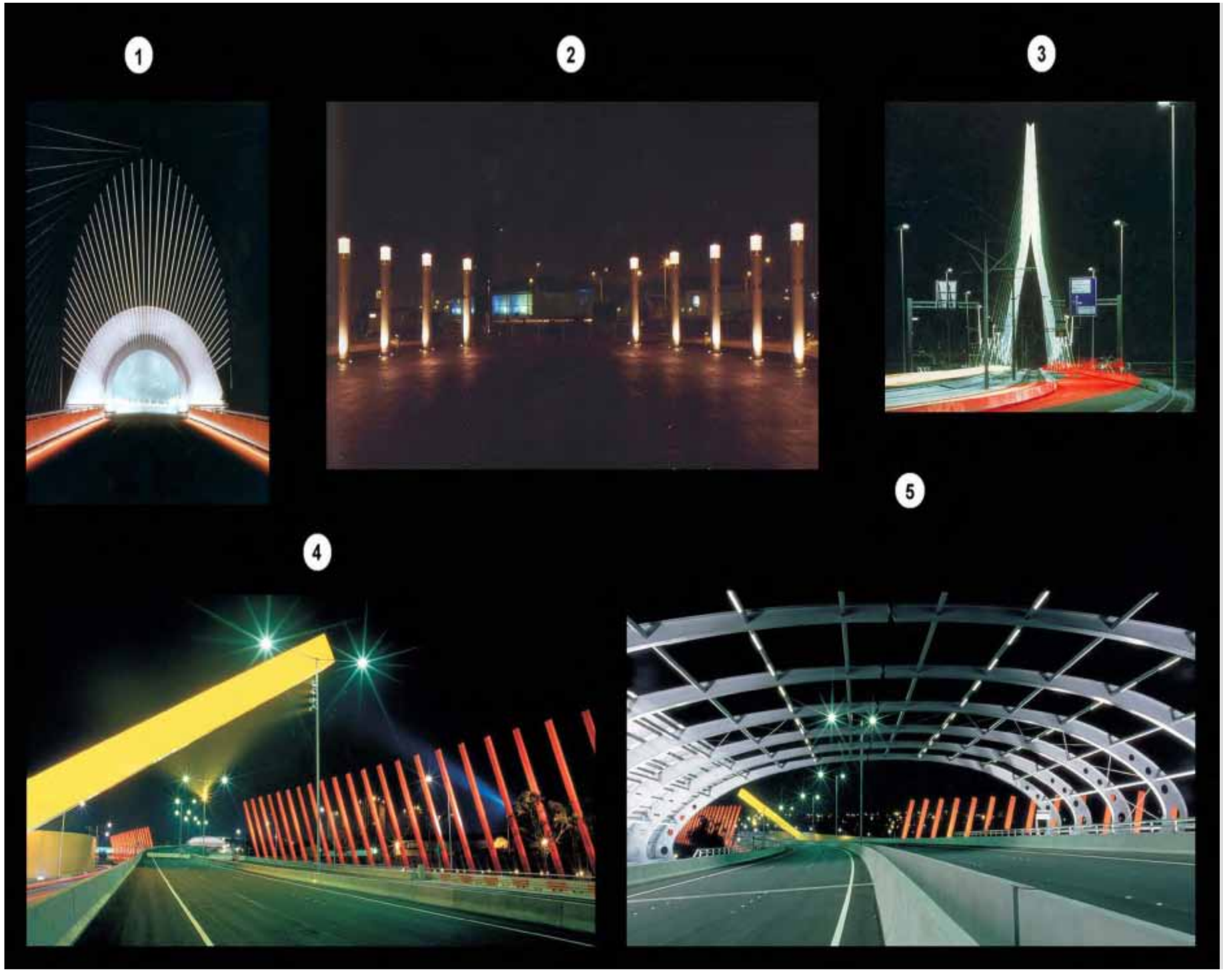
Drawing 2.1.1



Gateway Imagery.

1. **Milho Museum Entrance, Shigaraki , Japan**
   Visibly expressive gateway

2. **Light Columns, Cardiff, Wales**
   Subtle expression of pedestrian and vehicular level, announcing an entry point.

3. **Erasmus Bridge, Rotterdam, The Netherlands.**
   Creating a monumental gateway visible from great, distances.

4. **Wstern Link, Melbourne, Australia.**
   Bridge design highlighted throgh lighting.

5. **Western Link, Melbourne, Australia.**
   Experience of gateway as a journey through archways.

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Drawing 2.1.1

POLICY 3:

Establish lit Gateways to the main entrances into Putrajaya from perimeter roadway system.

Policy Objectives:

- Enhance the entry to the city of Putrajaya by day with structures or landscape feature at major points of introduction to the city. Some examples are illustrated in Figure 2.1.5
- Accentuate the visual entry to the city of Putrajaya by night through the use of light to the structure or landscape features.

Arrival into Putrajaya from surrounding areas should be well defined with clear points of entry both by day and by night. The concept of creating significant gateways that become pronouncements at night through the use of lighting of structures or landscaped features, rather than merely of signposts, will clearly distinguish these major arterial intersections as entrances to Putrajaya - the Garden City. Currently the major entrance from Kuala Lumpur, KLIA, and Cyberjaya are marked by ring roads and junctions with highway signage to mark *exits* rather than *entries* into Putrajaya. Since lighting alone cannot create a full Gateway image it will be necessary to design and construct a physical form that can be lit at night.

The Gateway design might take the form of a landscape feature, major signage structure, or a full or partial portal. The lighting design for the Gateways should take account of the fact that since Putrajaya is located beneath the flight path to KLIA, the plan view at night will be striking.

Putrajaya Gateways

A series of 6 Putrajaya Gateway locations have been identified reflecting the north, south, east and western entries into Putrajaya. These Gateways are:

- **Persiaran Persekutuan Gateway:**

The main Northern Gateway from Kuala Lumpur and Seremban. A Protocol Road leads commuters into this main entry to Precinct 1 Government offices.

- **Persiaran Utara-Timur Gateway:**

The main Eastern Gateway from Bangi to Putrajaya. A Protocol Road leads in into Precinct 1 Government offices and the Prime Minister's Residence. To the south it links into the Diplomatic Enclave and the Northern Region District (Precinct 2).

- **Persiaran Utara-Barat Gateway:**

Marks one of three entries from the western and links directly into the northern Protocol Roads.

- **Persiaran Barat Gateway:**

The main Western Gateway that links across directly in to the Core Island through Bridge 8. The Western Terminal and the Western Region District (Precinct 7 & Precinct 8) will also be connected directly to Persiaran Barat. Other important features are the links out to Cyberjaya.

Recommendations:

1. ***Establish 6 Putrajaya gateways to identify the main points of entry into Putrajaya.***
2. ***Consider design competitions to create the 6 major gateways.***
3. ***Acknowledge that the majority of bridges in Putrajaya form Core Island gateways to the city centre and light them accordingly.***

- **Persiaran Selatan Gateway:**

Marks the main Gateway that leads to the Convention Centre from the Northern Highway. Currently the intersection is not under construction but it is recognised that, at a much later stage, this will become a significant entry from the south into Putrajaya.

- **Lebuh Ehsan Gateway:**

The main entry from the east that leads to the Core Island through to Bridge 4 and Bridge 2.

Each of these 6 locations provides a major opportunity to establish a night time landmark through the placement of a physical gateway feature that is lit both attractively and sufficiently strongly to be visible from a considerable distance – at least one kilometre. The Policy 3 recommendation includes the proposal that the gateways become the subject of a design competition and the Brief for such a competition should strongly emphasise the role of lighting.

The 6 major gateways entering into the Core Administrative Centre are highlighted in Drawing 2.1.1.

Core Island Gateways

Additional Core Island gateways to the centre of the city include:

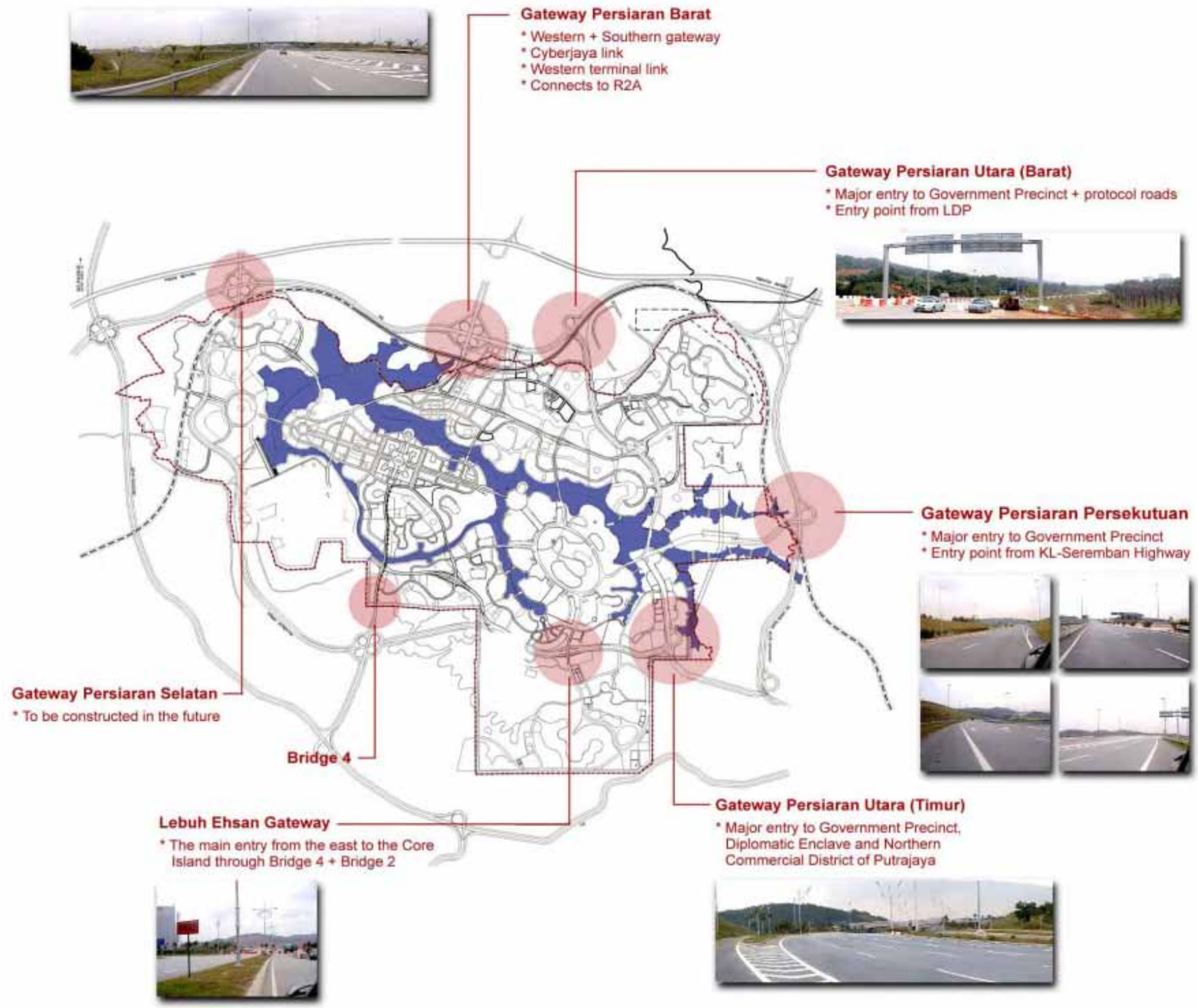
- Jambatan Putra
- Bridge 1 – Jambatan Seri Bakti
- Bridge 2 – Jambatan Seri Bestari
- Bridge 4 – Jambatan Seri Setia
- Bridge 6 – Jambatan Seri Gemilang
- Bridge 8 – Jambatan Seri Saujana
- Bridge 9 – Jambatan Seri Wawasan
- Bridge 10 – Jambatan Seri Perdana
- Bridge 11 – Monorail Bridge
- Bridge 12 – Monorail Bridge

(refer to Drawing 2.1.2)

In considering these bridges as minor or secondary gateways, attention should be given to their lighting in terms of ensuring that all bridges are lit throughout hours of darkness and that each bridge has a normal mode of lighting in addition to a possible festive mode.

Implementation Guideline:

See Section 3 - Design Guidelines for Individual Elements – Gateways



Putrajaya Gateways:

-Gateway Persiaran Persekutuan

-Gateway Persiaran Utara

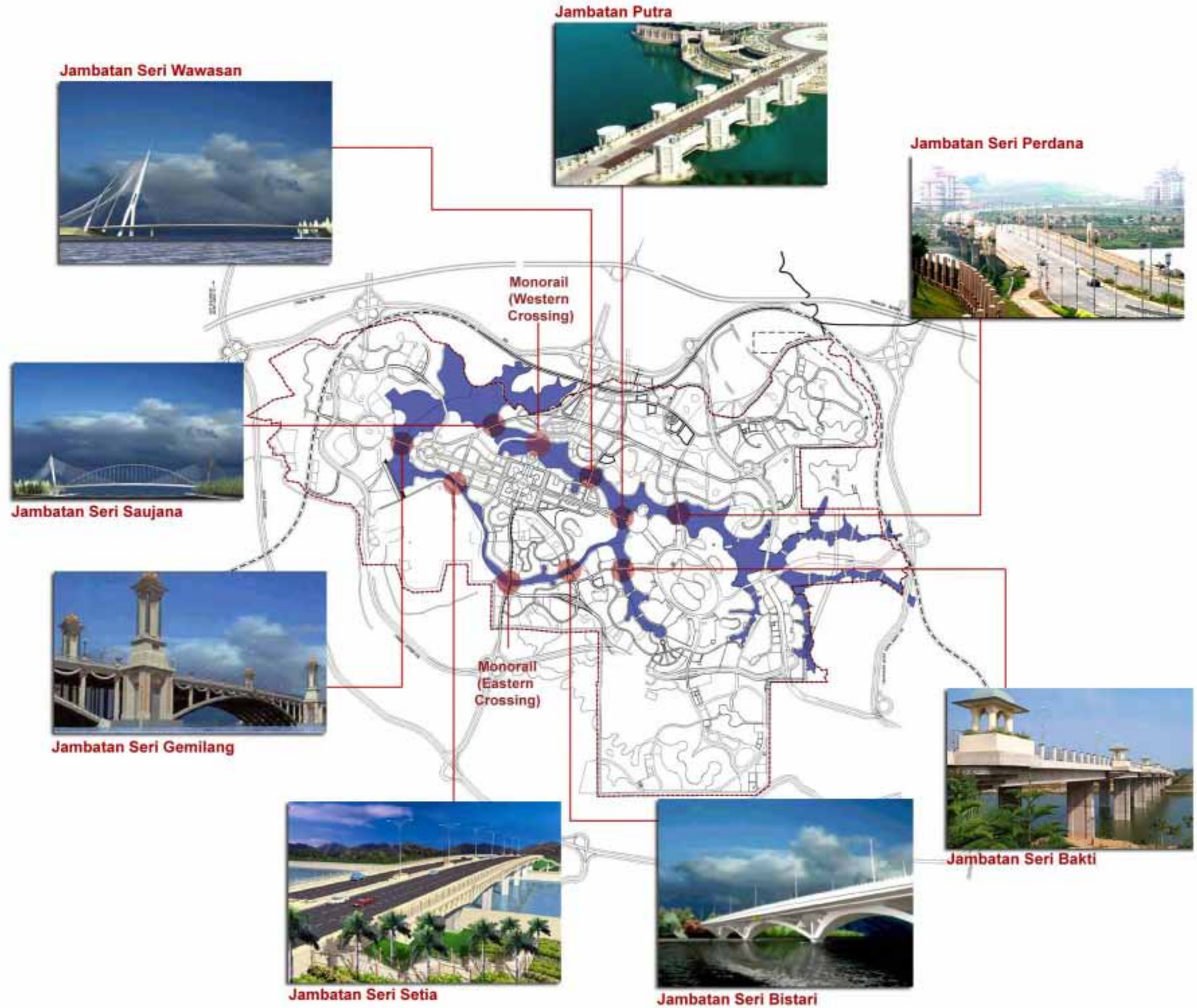
-Gateway Persiaran Barat

-Gateway Persiaran Selatan

-Lebuh Ehsan Gateway

-Gateway Persiaran Utara (Timur)

Final Report
September 2002
Drawing 2.1.1



Core Island

-Jambatan Seri Perdana

-jambatan Seri Putra

-Jambatan Seri Wawasan

-Jambatan Seri Gemilang

-Jambatan Seri Setia

-Jambatan Seri Bistari

-Jambatan Seri Bakti

Final Report
September 2002
Drawing 2.1.1

POLICY 4:

Engage the necessary personnel to secure the comprehensive implementation of the lighting objectives of the Lighting Masterplan within Perbadanan Putrajaya.

Throughout the world, lighting design and specification is undertaken by a wide variety of persons. These include architects, electrical engineers, landscape architects, interior designers, electrical contractors, lighting equipment manufacturers and specialist lighting design consultants. Only a few of these have formal qualifications in pure lighting. This is particularly the case in Malaysia where there appears to be no current (2002) opportunity to gain formal training in lighting. Much of Putrajaya lighting will therefore be designed and specified by persons who are qualified professionals in related disciplines such as architecture and electrical engineering and therefore rely on considerable support from the lighting manufacturing industry. Currently there is no possibility that qualified lighting specialists will submit the majority of lighting design for Putrajaya. Therefore, the development of a Lighting Masterplan introduces a requirement for Perbadanan Putrajaya (PJC) to include professional lighting skill and experience within its personnel structure.

Additionally, an absence of professional lighting staff within PJC is likely to lead to inadequate maintenance of installed lighting with a resulting deterioration of the night time visual quality.

Implementation Guideline:

See Appendix C – Lighting Personnel

Recommendations:

1. ***Secure the objectives and policies of the Lighting Masterplan.***
2. ***Ensure that lighting quality is sustained in the long term.***

POLICY 5:

Ensure that Perbadanan Putrajaya maintains operational control of lighting throughout the city including lighting to roads and streets, publicly and privately owned buildings, structures, landscapes and waterscapes. Additionally, establish a system to encourage the owners of private buildings to participate in the programme of external lighting.

Policy Objectives:

- Develop a nightscape that includes all the lit components necessary to create a comprehensive and legible presentation of the city, through the lighting of all appropriate buildings and structures and the assured operation such lighting.
- Enable the variation of the presentation of the nightscape through the selective lighting of various elements at varying times and occasions.

During the early and current (2002) stages of the development of Putrajaya, Perbadanan Putrajaya (PJC) and Putrajaya Holdings (PJH) have managed lighting control on a joint basis. The operational control of lighting has not been considered as an issue that either PJC or PJH includes in determining the overall image and presentation of the city at night. This means that the existing lighting of buildings, bridges, landscapes and waterside areas is operated on a relatively *ad hoc* basis on an installation-by-installation basis.

This, non centralised, control arrangement results in a situation where the co-ordinated operation of lighting becomes inconvenient and cumbersome, in that requests have to be made in advance to the various ministries and their building managers to switch on the lighting at a pre-agreed time for a pre-agreed period. It also means that it is not possible to conveniently make co-ordinated changes in the lit presentation of the city during the course of an evening.

Implementation Guideline:

See Section 3 – Lighting Planning, Control and Maintenance.

This summary Approval Checklist indicates the proposed technical requirements for lighting submissions at the various building and landscape application stages.

POLICY 6:

Extend the approvals process to embrace the requirement that all external lighting including Road and Street Lighting be submitted as a partial or separate approval application

Policy Objectives:

The statutory application recognises 3 category of submissions - building, landscape and infrastructure. The procedure is similar for each of the submission. The following stages of planning and approval process are identified as those that are appropriate to include lighting design and planning considerations (refer to summary statutory checklist in the next page for details):

- Layout Submission (SA)
- Planning Submission (PB)
- Building Plan (MB)
- Landscape Approval (KL)
- Certificate of Fitness (TF or TCF)
- Fitting certification (IP, EMC) only for property under PJC management

- **Layout Submission (SA)**

  Preliminary and outline statement of exterior elevation lighting principles where submission relates to a building. No lighting related requirements for landscape submissions at this stage.

- **Planning Submission (PB)**

  It is proposed that the technical checklist, submitted in support of the concept stage lighting design approach for a building exterior or a landscape, should include:

  – Range of typical luminance values to be used, expressed in candela/metre².
  – Range of light sources to be used.
  – Colour temperature values of light sources
  – Colour rendering characteristics of light sources
  – Number of anticipated programmed scenes or variations (Normal use, after hours, high days and holidays)
  – Initial visualisation(s) showing, as accurately as possible, the proposed image(s) of the building at night

- **Building Plan or Landscape Approval Submission**.

  At the next stage, Building Plan (MB) or Landscape Approval (KL) Submission a more detailed level of information will be required to evidence the quality of the proposed lighting. This should be described in terms of:

  – Developed visualisation(s) showing, as accurately as possible, the proposed image(s) of the building at night
  – General description of anticipated locations for luminaires
  – General description of luminaire fixing or mounting methods to be adopted

Recommendations:

1. ***Ensure that all aspects external lighting design and implementation are developed within the context of the policies of the Lighting Masterplan.***

2. ***Ensure that Perbadanan Putrajaya has the degree of detailed control required to ensure that proposed lighting installations comply with the visual and technical objectives of the Lighting Masterplan.***

   Ensure a coordinated approach to the lighting design for buildings, landscapes and other elements.

3. ***The statutory application recognises 3 categories of submissions – Building, Landscape and Infrastructure. For each of the submission the procedure is more or less the same.***

- Methods to be adopted to prevent stray light projecting above the horizontal and to prevent glare from public viewing angles (reduction of night sky light pollution)
- Description of light sources detailing type, wattage, colour rendering index, colour temperature and lamp life
- Description of the lighting control methodology and the final number of different lighting scenes to be incorporated within the programme
- A clear description of the intended maintenance methodology

- **Technical Detail Submission**

The external building and landscape Technical Detail Submission checklist will include:

- Full Detail circuiting of lighting sources
- Full description of luminaires, including IP rating, complete with plan showing their proposed location and fixing /mounting methods
- Full description of lighting control
- Equipment certification (Only for public buildings and street lighting)
- Photometric calculations (Only for Roads and Parks)
- Luminance mapping of the proposed lighting shown as an iso-candela overlay of the elevations and any other lit elements to clearly show the maximum anticipated luminance in candela/metre². Example given in Figure 2.1.7.

- **Certificate of Fitness**

Lastly, at the final stage of the completion of the project, the application of Certificate of Fitness is applied for (TF or TCF maybe given) A request follows for a visual inspection of the project. The visual inspection is carried out with statutory officers and the following will comprise the technical checklist:

Through inspection, confirm that all the building elevation lighting has been installed in accordance with Planning and Building Plan submissions

Implementation Guideline:

See Section 3 – Lighting Planning, Control and Maintenance

POLICY 6: SUMMARY OF GUIDELINES CHECKLIST

SUBMISSION PROCEDURE	BUILDING APPLICATION	PARKS	INFRASTRUCTURE	SIGNAGE
1 SUSUNATUR (SA)	1 SUSUNATUR (S.A.)	1 SUSUNATUR (S.A.)	1 Layout Planning Information	
(Layout Submission)	1.1 Lighting principle Lighting principle for development to tie back to overall objective of Lighting Masterplan.	1.1 Lighting principle Lighting principle for development to tie back to overall objective of Lighting Masterplan.	1.1 Lighting principle	
2 PENDIRIAN BANGUNAN (PB)	2 PENDIRIAN BANGUNAN (P.B.)	2 PENDIRIAN BANGUNAN (P.B.)	2 MENDIRIKAN INFRASTRUKTUR	1 PEMASANGAN PAPAN TANDA
(Planning Submission) MENDIRIKAN INFRASTRUKTUR (Infrastructure Approval)	2.1 Luminance Range Range of typical luminance values to be used in the design 2.2 Range of Light Source Range of light sources to be used. 2.3 Colour Rendering Range of colour rendering index **and** colour temperature of light sources to be used in the design. 2.4 Lighting Scenes Number of anticipated programmed scenes or variations in lighting. 2.5 Initial Lighting Images Images showing as accurately as possible proposed lighting scenes of the building at night. 2.6 Mounting Methods Fixing or mounting method adopted for luminaire (how light is concealed or integrated to building façade)	2.1 Luminance Range Range of typical luminance values to be used in the design. 2.2 Range of Light Source Range of light sources to be used. 2.3 Colour Rendering Range of colour rendering index **and** colour temperature of llight sources to be used in the design. 2.4 Lighting Scenes Number of anticipated programmed scenes or variations in lighting. 2.5 Initial Lighting Images Images showing as accurately as possible proposed lighting scenes of the building at night. 2.6 Mounting Methods Fixing or mounting method adopted to luminaire (how light is concealed or integrated to monuments or façade classed under Group A)	2.1 Luminance Range Range of typical luminance values to be used in the design (Only for monuments/ structures class as group A). 2.2 Colour Rendering Range of colour rendering index **and** colour temperature of light sources to be used in the design. 2.3 Lighting Scenes Number of anticipated programmed scenes or variations in lighting. 2.4 Lighting Images Images showing as accurately as possible proposed lighting scenes of the façade (for structure classed as Group A) at night.	1.1 Limitation to Luminance Maximum luminance values to be used in the design. 1.2 Construction Drawing Construction drawing of proposed signage showing lighting in or on signage.

SUBMISSION PROCEDURE	BUILDING APPLICATION	PARKS	INFRASTRUCTURE	SIGNAGE
		3 KELULUSAN LANSKAP (K.L.)	**2 MENDIRIKAN INFRASTRUKTUR**	**1 PEMASANGAN PAPAN TANDA**
	2.7 Final Lighting Images Images showing as accurately as possible proposed lighting scenes of the building at night.	3.1 Final Lighting Images Images showing as accurately as possible proposed lighting scenes of the building at night.		
	2.8 Luminance Prediction Luminance prediction for building facade is iso-candela and/or other graphic method of showing levels of luminance.	3.2 Luminance Prediction Luminance prediction for building facade is iso-candela and/or other graphic method of showing levels of luminance.	2.5 Luminance Prediction Luminance prediction for façade for structure (classed under Group A) and for motorways or roads; iso-candela and/or other methods of showing graphic levels of luminance.	1.3 Luminance Prediction Luminance prediction (maximum & average) of signage façade in iso-candela (for large signage).
	2.9 Mounting Methods Fixing or mounting method adopted for luminaire (how light fixtures are concealed or integrated to building façade), follow up to 2.6.	3.3 Mounting Methods Fixing or mounting method adopted to luminaire (how light fixtures are concealed or integrated to monuments or façade classed under Group A) as follow up to 2.6.	2.6 Mounting Methods Fixing or mounting method adopted to for luminaire (how light fixtures are concealed or integrated into structures classed under Group A).	
	2.10 Night Sky Light Pollution Method adopted to prevent stray lights from projecting above horizon and contributing to discomfort glare.	3.4 Night Sky Light Pollution Method adopted to prevent stray lights from projecting above horizon and contributing to discomfort glare.	2.7 Night Sky Light Pollution Method adopted to prevent stray lights from projecting above horizon and contributing to discomfort glare.	1.4 Night Sky Light Pollution Method adopted to prevent stray lights from projecting above horizon and contributing to discomfort glare (for large signage only – exceeding 4m²).
	2.11 Listing of Light Source Listing and description of light sources.	3.5 Listing of Light Source Listing and description of light sources.	2.8 Listing of Light Source Listing and description of light sources.	
	2.12 Lighting Control Description of lighting control method and the number of different lighting scenes.	3.6 Lighting Control Description of lighting control method and the number of different lighting scenes.	2.9 Lighting Control Description of lighting control method and the number of different lighting scenes.	
	2.13 Maintenance Method A general description of the intended maintenance method (only applicable for public maintained building)	3.7 Maintenance Method A general description of the intended maintenance method (only applicable for publicly maintained monuments or structure).	2.10 Maintenance Method A general description of the intended maintenance method (only applicable for public maintained monuments or structure).	

SUBMISSION PROCEDURE	BUILDING APPLICATION	PARKS	INFRASTRUCTURE	SIGNAGE
3 KELULUSAN TEKNIKAL (KT) **(Technical Approval))**	**3 KELULUSAN TEKNIKAL (K.T.)** 3.1 Circuit Diagram Only applicable for public maintained lighting; full details of circuit of lighting system. 3.2 Lighting Layout Details of lighting layout. 3.3 Luminaire Certification Only applicable for publicly maintained lighting; full description of luminaire including submission of ratings, standards and certificates 3.4 Detail Lighting Controls Applicable only for public maintained lighting; a follow up to 3.6.	**4 KELULUSAN TEKNIKAL (K.T.)** 4.1 Circuit Diagram Only applicable for public maintained lighting; full details of circuit of lighting system 4.2 Lighting Layout Details of lighting layout. 4.3 Luminaire Certification Only applicable for publicly maintained lighting; full description of luminaire including submission of ratings, standards and certificates 4.4 Detail Lighting Controls Applicable only for public maintained lighting; a follow up to 3.6.	**3 KELULUSAN TEKNIKAL (K.T.)** 3.1 Circuit Diagram Only applicable for public maintained lighting; full details of circuit of lighting system 3.2 Lighting Layout Details of lighting layout. 3.3 Luminaire Certification Only applicable for publicly maintained lighting; full description of luminaire including submission of ratings, standards and certificates 3.4 Detail Lighting Controls Applicable only for public maintained lighting; a follow up to 2.9.	
4 CERTIFICATE OF FITNESS (CF) **MENGAMBIL ALIH** **(Handing Over)**	**4 CERTIFCATE OF FITNESS (C.F.)** 4.1 Pre-Inspection Checklist Checklist of submission before initiating C.F. inspection. 4.2 C.F. Inspection Checklist for C.F. inspection. 4.3 Recommendations for C.F. Checklist for recommendations of C.F.	**5 CERTIFCATE OF FITNESS (C.F.)** 5.1 Pre-Inspection Checklist Checklist of submission before initiating C.F. inspection. 5.2 C.F. Inspection Checklist for C.F. inspection. 5.3 Recommendations for C.F. Checklist for recommendations of C.F.	**4 MENGAMBIL ALIH** 4.1 Pre-Inspection Checklist Checklist of submission before initiating hand-over inspection. 4.2 Hand-Over Inspection Checklist for hand-over inspection. 4.3 Acceptance Checklist Checklist before official acceptance or taking over.	**2 KELULUSAN PAPAN TANDA** 2.1 Pre-Inspection Checklist Checklist of submission before initiating hand-over inspection. 2.2 Approval Inspection Checklist for inspection. Inspection may only be carried out on large signage and unipole 2.3 Pre Approval Checklist Post inspection checklist before official approval.

POLICY 6:GUIDELINES CHECKLIST FOR BUILDING APPLICATION

Item	Description			Objective of Submission	Submission Check List		
						From Developer	Responsible person
1	**SUSUNATUR (SA)**			**Layout Planning Information**			
1.1	**Lighting Principle** Lighting principle for development to tie back to overall objective of Lighting Masterplan.		1.1	Simple commitment from developer that lighting system listed will be implemented and in accordance with the Lighting Masterplan.	1.1	Simple statement of lighting concept (a) Confirmation that the Building façade will be lit. (b) Landscape will be lit in appropriate areas. (c) Pedestrian areas will be lit in appropriate levels.	Planner Architect Electrical Engineer
2	**PENDIRIAN BANGUNAN (PB)**			**Building Concept Information**			
				Notes Buildings referred in procedures 2.1 to 2.5 shall only pertain to building or structures defined in the Lighting Masterplan as Group A, B or C. Submission procedure where applicable where landscape areas are included will however still be required.			
2.1	**Luminance Range** Range of typical luminance values to be used in the design.		2.1	Indication of lighting concept and to check it matches with the Lighting Masterplan.	2.1	Simple statement listing the range of luminance or illuminance levels to be applied in the lighting design: (a) Building façade – cd/m² to match category and lighting zone. (b) Landscape. parks, and pedestrian areas – lux levels in accordance with CIE codes for pedestrian traffic.	Architect Electrical Engineer Landscape Architect Lighting Specialist
2.2	**Range of Light Source** Range of light source to be used.		2.2	To ensure streetlights fit in with overall street furniture.	2.2	General statement listing the type of light fitting; e.g. (a) Building façade – high intensity narrow beam/ medium/ wide beam or focused flood lights, feature lights etc. (b) Landscape and pedestrian areas – lantern tops, bollards, feature lights etc.	Architect Landscape Architect Electrical Engineer Lighting Specialist
2.3	**Colour Rendering**		2.3	To ensure colour rendering and colour temperature fits in with the ambience prescribed by the Lighting Master plan.	2.3	General statement on colour rendering index and colour temperature to be used in the lighting design.	Architect

Item	Description			Objective of Submission		Submission Check List	
						From Developer	Responsible person
	Range of colour rendering index **and** colour temperature of light sources to be used in the design.						Landscape Architect Electrical Engineer Lighting Specialist
2.4	**Lighting Scenes** Number of anticipated programmed scenes or variations in lighting.		2.4	Ensure coordination with overall programmed lighting scenes in planning.	2.4	General statement listing the programmed scenes such as Normal /After Office Hours/ Festive / High Days /Security etc.	Architect Landscape Architect Electrical Engineer Lighting Specialist
2.5	**Initial Lighting Images** Images showing as accurately as possible proposed lighting scenes of the building at night.		2.5	Image of lighting concept similar to the architectural perspective. Lighting image for landscape pertain to general ambience and location of lighting. Special features for landscape lighting should be indicated (e.g. water feature etc).	2.5	Rendered drawings showing perspective or artist's concept of the night lighting scene(s). For landscape, drawings similar to landscape layout showing general location of light fixtures and perspective or artist's concept of night lighting scene(s) where special feature are included.	Architect Landscape Architect Electrical Engineer Lighting Specialist
2.6	**Mounting Methods** Fixing or mounting method adopted for luminaire (how light is concealed or integrated to building façade)		2.6	To ascertain that light fittings as building fixtures or street furniture are not mounted in an obtrusive manner with negative impact on the general visual façade or landscape.	2.6	Statement or drawing describing or showing location of light fixtures. Mounting methods are as follows (a) Conceal or integrated into onto building façade or structure; (b) Surface mounted onto building surface or structure; and/or (c) Planted in ground on pole or plinth or on mounting base planted below-ground.	Architect Landscape architect Electrical Engineer Lighting Specialist

Item	Description			Objective of Submission		Submission Check List	
						From Developer	Responsible person
				Design Development Information			
2.7	**Final Lighting Images** Images showing as accurately as possible proposed lighting scenes of the building at night.		3.1	Update to 2.5 above.	3.1	Submission of images including rendered perspective drawings, artist's concept, computer generated drawing of colour images of the night lighting scene(s). (a) Building façade – rendered images or artist's perspective. (b) Landscape – images of feature lighting and concept similar to landscape images.	Architect Landscape Architect Electrical Engineer Lighting Specialist
2.8	**Iso-Luminance Mapping** Luminance forecast of building facade iso-candela /lux and/or colour banding (levels of luminance)		3.2	To ascertain compliance with design intent described in 3.2 above.	3.2	Submission for luminance or illuminance prediction to comprise computer generated iso-candela or iso-lux mapping or manually calculated maximum, minimum and average luminance values. (a) Building elevations – Luminance prediction is preferred in the form of iso-candela mapping across the complete elevations or other graphic techniques that show the gradation and peaks of luminance. Alternatively, manually calculated 'spot' maximum and minimum luminance values with an average may be submitted. (b) Landscape areas – iso-candela for monuments and iso-lux for pedestrian areas where applicable.	Architect Electrical Engineer Lighting Specialist
2.9	**Mounting Methods** Fixing or mounting method adopted for luminaire (how light is concealed or integrated to building façade)/ Follow up to 2.6.		3.3	Follow up details from 2.6.	3.3	Follow up details from 2.6 if available or applicable. Details will include drawings showing location of prominent luminaries and mounting methods:	Architect Landscape architect Electrical Engineer Lighting Specialist

Item	Description			Objective of Submission		Submission Check List	
						From Developer	Responsible person
2.10	**Night Sky Pollution** Method adopted to prevent stray lights from projecting above horizon and contributing to discomfort glare.		3.4	To minimise night sky light pollution (refer Appendix C) Table C2.4 (shielding standard - good practice guide to minimise sky glow and glare) Table C2.6 (lumens limitation per acre – benchmark to check that landscape lighting design allowance is not exceeded). Images in last 3 pages of Appendix C (Good Lighting Practice Guide).	3.4	Concept statement on methods adopted to minimise night time sky light pollution. Methods include: (a) Shielding standard (b) Limits to lumens per acre ('lumen cap') (c) Specific statement or drawing showing lamp shielding or focusing especially globe lights or flood lights. Drawings to back-up statement may be submitted if appropriate.	Architect Landscape architect Electrical Engineer Lighting Specialist
2.11	**Listing of Light Source** Listing and description of light sources		3.5	Ascertain compliance to good engineering practice. Fixtures under private maintenance will only require a general listing; whilst fixtures to be handed over for public maintenance should be have detail description and listing.	3.5	For private maintained fixture a general listing on the type of light source. For public maintained fixture (public roads, parks facilities etc) a detail listing with detailed engineering description or specification (details required to be specified by Perbadandan, Engineering Department) should be submitted.	Electrical Engineer Lighting Specialist
2.12	**Lighting Control** Description of lighting control method and the number of different lighting scenes.		3.6	Ascertain degree of lighting control and coordinate with public switched lighting where applicable.	3.6	For private maintained fixture statement on lighting control: (a) Manual/ time switch / photo-cell or computer-automated time switching. (b) Provision for connection of façade lighting on separate circuits for possible future connection of separate electrical meter. For public maintained fixture (a) Manual/ time switch / light sensor or computer-automated time switching. (b) Provision of automated control and monitoring. Future detail and liaison with I.T. department of Perbadanan required.	Electrical Engineer Electrical Engineer

Item	Description			Objective of Submission	Submission Check List		
						From Developer	Responsible person
2.13	**Maintenance Method** A general description of the intended maintenance method (only applicable for public maintained building).		3.7	Ensure compliance to Perbadanan maintenance methodology.	3.7	Only for public maintained lighting; a statement listing maintenance methodology: (a) Lamp cleaning interval factor used in calculating luminance or illuminance level. (b) Relamping cycle. (c) Other information required by Perbadanan.	Electrical Engineer Lighting Specialist
3	**KELULUSAN TEKNIKAL (KL)**			**Detail Design Information**			
3.1	**Circuit Diagram** Only applicable for public maintained lighting; full details of circuit of lighting system.		4.1	Integrity of engineering design.	4.1	Submission only applicable for public maintained lighting system: (a) Circuit diagram (b) Feeder pillar design.	Electrical Engineer
3.2	**Lighting Layout** Details of lighting layout.		4.2	Technical compliance with design and to check coordination with façade fixture or street furniture.	4.2	For private maintained light fixture; a simple layout as a follow up to procedure 3.3 above. For public maintained light fixture; details (with drawings where applicable) to be submitted (a) Lighting location and layout; (b) Mounting details; (c) Other details required by Perbadanan	Electrical Engineer Lighting Specialist
3.3	**Luminaire Certification** Only applicable for public maintained lighting; full description of luminaire including submission of ratings, standards and certificates.		4.3	Good engineering practice and technical compliance.	4.3	Only required for public maintained lighting fixtures. Detail engineering submission include (a) Engineering ratings (IP, EMC standards, ballast losses, shielding standard etc) (b) Certification by independent testing laboratory of engineering standards. Components under the control of the Suruhanjaya Tenaga (Jabatan Elektrik) should also be approved.	Electrical Engineer

Item	Description			Objective of Submission		Submission Check List	
						From Developer	Responsible person
3.4	**Detail Lighting Controls** Applicable only for public maintained lighting; a follow up to 3.6.		4.4	To check for coordination with public maintained control and switching.	4.4	Only required for public maintained lighting system; details of lighting controls (if not already described in 4.1). If automation controls are implemented liaison and approval should be sought from Perbadanan (IT department)	Electrical Engineer
4	**CERTIFICATION OF FITNESS (C.F.)**			**Issuance of C.F.**			
4.1	**Pre-Inspection Checklist** Checklist of submission before initiating C.F. inspection.		5.1	To ensure all items complied with before C.F. inspection.	5.1	To compile and submit checklist of approvals before inspection: (a) Building (b) Landscape (c) Engineering (d) Certification by Electrical Engineer responsible.	Architect as part of overall CF checklist and application for inspection. Electrical Engineer
4.2	**C.F. Inspection** Checklist for C.F. inspection.		5.2	Inspection to ensure compliance to lighting approved plans, design concept and Lighting Masterplan. A checklist of inspection for Perbadanan include: (a) Visual inspection. (b) Types of luminaire. (c) Check for obvious case of light trespass, glare and sky pollution. (d) Witness luminance (cd/m²) or illuminance (lux) measurements. (e) Witness operation check.	5.2	Conduct the following: (a) Visual inspection (b) Luminance measurement (using luminance meter) or illuminance measurement (using illuminance meter) (c) Operation check (switch on all lights, switch on programmed scenes, operational check of controls etc).	Electrical Engineer Lighting Specialist Lighting Supplier or Contractor

Item	Description			Objective of Submission	Submission Check List		
						From Developer	Responsible person
4.3	**<u>Recommendations for C.F.</u>** Checklist for recommendations of C.F.		5.3	Final checklist before issuance of C.F.	5.3	<u>For private maintained</u> lighting system: (a) Report of C.F. inspection. <u>For public maintained</u> lighting system: (a) Report of C.F. inspection. (c) Compilation of As Built Drawings, Inventory list, Maintenance manuals (manual applicable only for automated controls or new engineering systems) and other engineering details requested by Perbananan. (d) Handing over of keys (feeder pillars) and spare parts.	Architect as part of C.F. submission. Electrical Engineer Lighting Supplier

POLICY 6 – DETAIL STATUTORY CHECKLIST FOR PARKS

Item	Description			Objective of Submission	Submission Check List		
						From Developer	Responsible person
1	**SUSUNATUR (SA)**			**Layout Planning Information**			
1.1	**Lighting Principle** Lighting principle for development to tie back to overall objective of Lighting Masterplan		1.1	Simple commitment from developer that lighting system listed will be implemented and in accordance with the Lighting Masterplan.	1.1	Simple statement of lighting concept (a) Landscape will be lit in appropriate areas. (b) Pedestrian areas will be lit to appropriate levels. (c) Monuments or large structure will be considered under 'Building Application.'	Planner Architect Electrical Engineer
2	**PENDIRIAN BANGUNAN (PB)**			**Design Concept Information**			
				Notes All monuments or structures referred herein this section and classed under Group A in the Masterplan will require lighting façade submission under 2.1 to 2.5.			
2.1	**Luminance Range** Range of typical luminance values to be used in the design (Only for monuments/ structures class as group A).		2.1	Indication of lighting concept and to check it matches with the Lighting Masterplan.	2.1	Simple statement listing the range of lighting levels to be applied in the lighting design: (a) Monuments or large structure classed as Group A – cd/m² to match category and lighting zone. (b) Landscape. parks, and pedestrian areas – lux levels in accordance with CIE codes for pedestrian traffic.	Architect Electrical Engineer Landscape Architect Lighting Specialist
2.2	**Range of Light Sources** Range of light sources to be used.		2.2	To ensure streetlights fit in with overall street furniture.	2.2	General statement listing the type of light fitting; e.g. (a) Monuments or structure classed as Group A– high intensity narrow beam/ medium/ wide beam or focused flood lights, feature lights etc. (b) Landscape and pedestrian areas – lantern tops, bollards, feature lights etc.	Architect Landscape Architect Electrical Engineer

Item	Description			Objective of Submission	Submission Check List		
						From Developer	Responsible person
							Lighting Specialist
2.3	**Colour Rendering** Range of colour rendering index **and** colour temperature of light sources to be used in the design.		2.3	To ensure colour rendering and colour temperature fits in with the ambience prescribed by the Lighting Master plan/	2.3	General statement on colour rendering index and colour temperature to be used in the lighting design.	Architect Landscape Architect Electrical Engineer Lighting Specialist
2.4	**Lighting Scenes** Number of anticipated programmed scenes or variations in lighting.		2.4	Ensure coordination with overall programmed lighting scenes in planning.	2.4	General statement listing the programmed scenes such as Normal /After Office Hours/ Festive / High Days /Security etc.	Architect Landscape Architect Electrical Engineer Lighting Specialist
2.5	**Initial Lighting Images** Images showing as accurately as possible proposed lighting scenes of the building at night.		2.5	Image of lighting concept similar to the architectural perspective. Lighting image for landscape pertain to general ambience and location of lighting fixtures. Special features for landscape lights should be indicated (e.g. water feature etc).	2.5	Rendered drawings showing perspective or artist concept of the night lighting scene(s). For landscape, drawings similar to landscape layout showing general location of lights and perspective or artist concept of night lighting scene(s) where special feature are included.	Architect Landscape Architect Electrical Engineer Lighting Specialist
2.6	**Mounting Methods** Fixing or mounting method adopted to luminaire (how light is concealed or integrated to monuments or façade classed under Group A)		2.6	To ascertain that light fittings as fixtures or street furniture are not mounted in an obtrusive manner with negative impact on the general visual façade or landscape.	2.6	Statement or drawing describing or location of light fixtures. Mounting methods are as follows (a) Conceal or integrated into onto monuments/structure façade. (b) Surface mounted onto building surface or structure; and/or (c) Planted in ground on pole or plinth or on mounting base planted below-ground.	Architect Landscape architect Electrical Engineer Lighting Specialist

Item	Description			Objective of Submission		Submission Check List From Developer	Responsible person
3	**KELULUSAN LANSKANP (KL)**			**Design Development Information**			
3.1	**Final Lighting Images** Images showing as accurately as possible proposed lighting scenes of the monuments or structures (classed as Group A) at night.		3.1	Update to 2.5 above.	3.1	Submission of images include rendered perspective drawings, artist concept, computer generated drawing of colour images of the night lighting scene(s). (a) Monuments or large structure class as Group A – rendered images or artist perspective. (b) Landscape – images on feature lighting and concept similar to landscape images.	Architect Landscape Architect Electrical Engineer Lighting Specialist
3.2	**Luminance Prediction** Luminance prediction for building facade as iso-candela and/or other graphic method of showing levels of luminance.		3.2	To ascertain compliance with design intent described in 3.2 above.	3.2	Submission for luminance or illuminance prediction to comprise computer generated iso-candela or iso-lux mapping or manually calculated maximum, minimum and average luminance values. (a) Elevations of monuments or structure (classed as Group A) – Luminance prediction is preferred in the form of iso-candela mapping across the complete elevations or other graphic techniques that show the gradation and peaks of luminance. Alternatively, manually calculated 'spot' maximum and minimum luminance values with an average may be submitted. (b) Landscape areas – iso-candela for monuments and iso-lux for pedestrian areas where applicable.	Architect Electrical Engineer Lighting Specialist
3.3	**Mounting Methods** Fixing or mounting method adopted to luminaire (how light fixtures are concealed or integrated to monuments or façade classed under Group A) as follow up to 2.6.		3.3	Follow up and update to 2.6 above.	3.3	Follow up details from 2.6 if available or applicable. Details will include drawings showing location of prominent luminaries and mounting methods:	Architect Landscape architect Electrical Engineer Lighting Specialist

Item	Description			Objective of Submission		Submission Check List	
						From Developer	Responsible person
3.4	**Night Sky Light Pollution** Method adopted to prevent stray lights from projecting above horizon and contributing to discomfort glare.		3.4	To minimise night sky light pollution (refer Appendix C) Table C2.4 (shielding standard - good practice guide to minimise sky glow and glare) Table C2.6 (lumens limitation per acre – benchmark to check that landscape lighting design allowance is not exceeded). Images in last 3 pages of Appendix C (good lighting practice guide).	3.4	Concept statement on methods adopted to minimise night light sky pollution. Methods include: (a) Shielding standard (b) Limits to lumens per acre ('lumen cap') (c) Specific statement or drawing showing lamp shielding or focusing especially globe lights or flood lights. Drawings to back-up statement may be submitted if appropriate.	Architect Landscape architect Electrical Engineer Lighting Specialist
3.5	**Listing of Light Source** Listing and description of light sources		3.5	Ascertain compliance to good engineering practice. Fixtures under private maintenance will only require a general listing; whilst fixtures to be handed over for public maintenance should be have detail description and listing.	3.5	For private maintained fixture a general listing on the type of light source. For public maintained fixture (public roads, parks facilities etc) a detail listing with detailed engineering description or specification (details required to be specified by Perbadandan, Engineering Department) should be submitted.	Electrical Engineer Lighting Specialist
3.6	**Lighting Control** Description of lighting control method and the number of different lighting scenes.		3.6	Ascertain degree of lighting control and coordinate with public switched lighting where applicable.	3.6	For private maintained fixture statement on lighting control: (a) Manual/ time switch / light sensor or computer-automated time switching. (b) Provision for connection of façade lighting on separate circuits for possible future connection of separate electrical meter. For public maintained fixture (a) Manual/ time switch / light sensor or computer-automated time switching.	Electrical Engineer Electrical Engineer

Item	Description			Objective of Submission	Submission Check List		
						From Developer	Responsible person
						(b) Provision of automated control and monitoring. Future detail and liaison with I.T. department of Perbadanan required.	
3.7	**Maintenance Method** A general description of the intended maintenance method (only applicable for public maintained monuments or structure).		3.7	Ensure compliance to Perbadanan maintenance methodology.	3.7	Only for public maintained lighting; a statement listing maintenance methodology: (a) Lamp cleaning interval factor used in calculating luminance or illuminance level. (b) Relamping cycle. (c) Other information required by Perbadanan.	Electrical Engineer Lighting Specialist
4	**KELULUSAN TEKNIKAL (KL)**			**Detail Design Information**			
4.1	**Circuit Diagram** Only applicable for public maintained lighting; full details of circuit of lighting system.		4.1	Integrity of engineering design.	4.1	Submission only applicable for public maintained lighting system: (a) Circuit diagram (b) Feeder pillar design.	Electrical Engineer
4.2	**Lighting Layout** Details of lighting layout.		4.2	Technical compliance with design and to check coordination with façade fixture or street furniture.	4.2	For private maintained light fixture; a simple layout as a follow up to procedure 3.3 above. For public maintained light fixture; details (with drawings where applicable) to be submitted (a) Lighting location and layout; (b) Mounting details; (c) Other details required by Perbadanan	Electrical Engineer Lighting Specialist
4.3	**Luminaire Certification** Only applicable for public maintained lighting; full description of luminaire including submission of ratings, standards and certificates.		4.3	Good engineering practice and technical compliance.	4.3	Only required for public maintained lighting fixtures. Detail engineering submission include (a) Engineering ratings (IP, EMC standards, ballast losses, shielding standard etc)	Electrical Engineer

Item	Description			Objective of Submission	Submission Check List		
						From Developer	Responsible person
						(b) Certification by independent testing laboratory of engineering standards. Components under the control of the Suruhanjaya Tenaga (Jabatan Elektrik) should also be approved.	
4.4	**Detail Lighting Controls** Applicable only for public maintained lighting; a follow up to 3.6.		4.4	To check for coordination with public maintained control and switching.	4.4	Only required for public maintained lighting system; details of lighting controls (if not already described in 4.1). If automation controls are implemented liaison and approval should be sought from Perbadanan (IT department)	Electrical Engineer
5	**CERTIFICATION OF FITNESS (C.F.)**			**Issuance of C.F.**			
5.1	**Pre-Inspection Checklist** Checklist of submission before initiating C.F. inspection.		5.1	To ensure all items complied with before C.F. inspection.	5.1	To compile and submit checklist of approvals before inspection: (a) Landscape (b) Engineering (c) Certification by Electrical Engineer responsible.	Architect as part of overall CF checklist and application for inspection. Electrical Engineer
5.2	**C.F. Inspection** Checklist for C.F. inspection.		5.2	Inspection to ensure compliance to lighting approved plans, design concept and Lighting Masterplan. A checklist of inspection for Perbadanan include: (a) Visual inspection. (b) Types of luminaire. (c) Check for obvious case of light trespass, glare and sky pollution. (d) Witness luminance (cd/m²) or illuminance (lux) measurements. (e) Witness operation check.	5.2	Conduct the following: (a) Visual inspection (b) Luminance measurement (using luminance meter) or illuminance measurement (using illuminance meter) (c) Operation check (switch on all lights, switch on programmed scenes, operational check of controls etc).	 Electrical Engineer Lighting Specialist Lighting Supplier or Contractor
5.3	**Recommendation for C.F.** Checklist for recommendation of C.F.		5.3	Final checklist before issuance of C.F.	5.3	For private maintained lighting system: (a) Report of C.F. inspection. For public maintained lighting system: (a) Report of C.F. inspection.	Architect as part of C.F. submission. Electrical Engineer

Item	Description			Objective of Submission	Submission Check List		
						From Developer	Responsible person
						(c) Compilation of As Built Drawings, Inventory list, Maintenance manuals (manual applicable only for automated controls or new engineering systems) and other engineering details requested by Perbananan. (d) Handing over of keys (feeder pillars) and spare parts.	Lighting Supplier

POLICY 6 – GUIDELINES CHECKLIST FOR: INFRASTRUCTURE APPLICATION

Item	Description			Objective of Submission	Submission Check List		
						From Developer	Responsible person
1	**SUSUNATUR (SA)**			**Layout Planning Information**			
1.1	**Lighting Principle** Lighting principle for development to tie back to overall objective of Lighting Masterplan		1.1	Simple commitment from developer that lighting system listed will be implemented and in accordance with the Lighting Masterplan.	1.1	Simple statement of lighting concept (a) Large structure (e.g. bridge) is classified as building; in such case (and if structure is also classed as Group A under the Lighting Masterplan) façade lighting submission will be required. (b) Motorways to be lit to appropriate CIE standards. (c) Roads to be handed as public roads (e.g. roads to residential areas) to be lit to appropriate CIE standards.	Planner Architect Civil Engineer Electrical Engineer
2	**MENDIRIKAN INFRASTRUKTUR (MI)**			**Design Development Information**			
				Notes All monuments or large structures referred in this section and classed under Group A will required façade lighting submission under 2.1 to 2.5.			
2.1	**Luminance Range** Range of typical luminance values to be used in the design (Only for monuments/ structures class as group A).		2.1	Indication of lighting concept and to check it match with the Lighting Masterplan.	2.1	Simple statement listing the range of lighting levels to be applied in the lighting design: (a) Large structure classed as Group A – cd/m² to match category and lighting zone.	Architect Civil Engineer Electrical Engineer

Item	Description			Objective of Submission		Submission Check List From Developer	Responsible person
						(b) Roads and motorways – cd/m² in accordance with CIE codes for roads and motorways. (c) Pedestrian areas – lux levels in accordance with CIE codes for pedestrian traffic.	Lighting Specialist
2.2	**Colour Rendering** Range of colour rendering index **and** colour temperature of light source to be used in the design.		2.2	To ensure colour rendering and colour temperature fits in with the ambience prescribed by the Lighting Master plan.	2.2	General statement on colour rendering index and colour temperature to be used in the lighting design.	Architect Electrical Engineer Lighting Specialist
2.3	**Lighting Scenes** Number of anticipated programmed scenes or variations in lighting.		2.3	Ensure coordination with overall programmed lighting scenes in planning.	2.3	General statement listing the programmed scenes such as Normal /After Office Hours/ Festive / High Days /Security etc.	Architect Civil Engineer Electrical Engineer Lighting Specialist
2.4	**Lighting Images** Images showing as accurately as possible proposed lighting scenes of the façade (for structure classed as Group A) at night.		2.5	Image of lighting concept similar to the architectural perspective (only for structure classed as Group A). Lighting image for landscape pertain to general ambience and location of lighting. Special features for landscape lighting should be indicated (e.g. water feature etc).	2.5	Rendered drawings showing perspective or artist concept of the night lighting scene(s). For landscape, drawings similar to landscape layout showing general location of light fixtures and perspective or artist concept of night lighting scene(s) where special feature are included. No images required for roads or motorways.	Architect for structure Civil Engineer Electrical Engineer Lighting Specialist
2.5	**Initial Lighting Images** Images showing as accurately as possible proposed lighting scenes of the building at night.		2.6	To ascertain compliance with design intent described in 2.5 above.	2.6	Submission for luminance or illuminance prediction to comprise computer generated iso-candela or iso-lux mapping or manually calculated maximum, minimum and average luminance values. (a) Elevations of structure (classed as Group A) – Luminance prediction is preferred in the form of iso-candela mapping across the complete elevations or other graphic techniques that show the gradation and peaks of luminance. Alternatively, manually calculated 'spot' maximum and minimum luminance values with an average may be submitted.	Architect for structure Civil Engineer Electrical Engineer Lighting Specialist

Item	Description			Objective of Submission		Submission Check List	
						From Developer	Responsible person
						(b) Landscape areas – iso-candela for monuments and iso-lux for pedestrian areas where applicable. (c) Motorways and roads – iso-candela based on CIE recommendations.	
2.6	**<u>Mounting Methods</u>** Fixing or mounting method adopted to for luminaire (how light fixtures are concealed or integrated into structures classed under Group A)		2.7	To ascertain that light fittings as fixtures or street furniture are not mounted in an obtrusive manner with negative impact on the general visual façade or landscape.	2.7	Statement or drawing describing or location of light fixtures. Mounting methods are as follows (a) Conceal or integrated into onto large structure façade. (b) Surface mounted onto building surface or structure (c) Planted in ground on pole or plinth or on mounting base planted below-ground.	Architect for structure Civil Engineer Electrical Engineer Lighting Specialist
2.7	**<u>Night Sky Light Pollution</u>** Method adopted to prevent stray light from projecting above horizon and contributing to discomfort glare.		2.8	To minimise night sky light pollution (refer Appendix C) Table C2.4 (shielding standard - good practice guide to minimise sky glow and glare) Table C2.6 (lumens limitation per acre – benchmark to check that landscape lighting design allowance is not exceeded). Images in last 3 pages of Appendix C (Good Lighting Practice Guide).	2.8	Concept statement on methods adopted to minimise night time sky light pollution. Methods include: (a) Shielding standard (b) Specific statement or drawing showing lamp shielding or focusing especially globe lights or flood lights. Drawings to back-up statement may be submitted if appropriate.	Architect for structure Electrical Engineer Lighting Specialist
2.8	**<u>Listing of Light Source</u>** Listing and description of light sources		2.9	Ascertain compliance to good engineering practice. Fixtures under private maintenance will only require a general listing; whilst fixtures to be handed over for public maintenance should be have detail description and listing.	2.9	<u>For public maintained facilities</u> (public roads, public facilities etc) a detail listing with detailed engineering description or specification (details required to be specified by Perbadanan, Engineering Department) should be submitted.	Electrical Engineer Lighting Specialist

Item	Description			Objective of Submission		Submission Check List: From Developer	Responsible person
2.9	**Lighting Control** Description of lighting control method and the number of different lighting scenes.		2.10	Ascertain degree of lighting control and coordinate with public switched lighting where applicable.	2.10	For public maintained fixture (a) Manual/ time switch / photo cell or computer-automated time switching. (b) Provision of automated control and monitoring. Future detail and liaison with I.T. department of Perbadanan required.	Electrical Engineer Lighting Specialist
2.10	**Maintenance Method** A general description of the intended maintenance method (only applicable for public maintained monuments or structure).		2.11	Ensure compliance to Perbadanan maintenance methodology.	3.7	For public maintained lighting; a statement listing maintenance methodology: (a) Lamp cleaning interval factor used in calculating luminance or illuminance level. (b) Relamping cycle. (c) Other information required by Perbadanan.	Electrical Engineer Lighting Specialist
3	**KELULUSAN TEKNIKAL (KL)**			**Detail Design & Installation**			
3.1	**Circuit Diagram** For public maintained lighting; full details of circuit of lighting system.		3.1	Integrity of engineering design.	3.1	For public maintained lightings: (a) Circuit diagram (b) Feeder pillar design.	Electrical Engineer
3.2	**Lighting Layout** Details of lighting layout.		3.2	Technical compliance with design and to check coordination with façade fixture or street furniture.	3.2	For public maintained light fixture; details (with drawings where applicable) to be submitted (a) Lighting location and layout; (b) Mounting details; (c) Other details required by Perbadanan	Electrical Engineer Lighting Specialist

Item	Description			Objective of Submission		Submission Check List From Developer	Responsible person
3.3	**Luminaire Certification** For public maintained lighting; full description of luminaire including submission of ratings, standards and certificates.		3.3	Good engineering practice and technical compliance.	3.3	For public maintained lighting fixtures. Detail engineering submission include (a) Engineering ratings (IP, EMC standards, ballast losses, shielding standard etc) (b) Certification by independent testing laboratory of engineering standards. Components under the control of the Suruhanjaya Tenaga (Jabatan Elektrik) should also be approved.	Electrical Engineer
3.4	**Detail Lighting Controls** For public maintained lighting; as follow up to 2.10		3.4	To check for coordination with public maintained control and switching.	3.4	For public maintained lighting system; details of lighting controls (if not already described in 3.1). If automation controls are implemented liaison and approval should be sought from Perbadanan (IT department)	Electrical Engineer
4	**MENGAMBIL ALIH (M.A.)**			**Handing Over Infrastructure**			
4.1	**Pre-Inspection Checklist**		4.1	To ensure all items complied with before handing over inspection.	4.1	To compile and submit checklist of approvals before inspection: (a) Landscape (b) Engineering (c) Certification by Electrical Engineer responsible.	Engineer concerned as part of overall handover checklist and application for inspection. Electrical Engineer
4.2	**Handing Over Inspection** Checklist for handing over inspection.		4.2	Inspection to ensure compliance to lighting approved plans, design concept and Masterplan. A checklist of inspection for Perbadanan include: (a) Visual inspection. (b) Types of luminaire. (c) Check for obvious case of light trespass, glare and night sky light pollution. (d) Witness luminance (cd/m²) or illuminance (lux) measurements.	4.2	Conduct the following: (a) Visual inspection (b) Luminance measurement (using luminance meter) or illuminance measurement (using illuminance meter) (c) Operation check (switch on all lights, switch on programmed scenes, operational check of controls etc).	Electrical Engineer Lighting Specialist Lighting Supplier or Contractor

Item	Description			Objective of Submission		Submission Check List From Developer	Responsible person
				(e) Witness operation check.			
4.3	**Acceptance Checklist** Checklist before official acceptance or taking over.		4.3	Final checklist before acceptance or taking over.	4.3	For public maintained lighting system: (a) Report of Handing Over inspection. (b) Compilation of As Built Drawings, inventory list, Maintenance manuals and other engineering details requested by Perbananan. (c) Handing over of keys (feeder pillars) and spare parts.	Engineer concerned as part of taking over submission. Electrical Engineer Lighting Supplier

POLICY 6 – DETAIL GUIDELINES CHECKLIST FOR: SIGNAGE

Item	Description			Objective of Submission	Submission Check List		
						From Developer	Responsible person
1	**MENDIRIKAN PAPAN TANDA (MS)**			**Design Information**			
1.1	**Limitation to Luminance** Maximum luminance values to be used in the design		1.1	Indication to confirm lighting level (luminance) do not exceed recommended level in Lighting Masterplan.	1.1	Simple statement confirming that luminance level will not exceed the maximum value prescribed in the Lighting Masterplan.	Signage Contractor Lighting Specialist
1.2	**Construction Drawing** Construction drawing of proposed signage showing lighting in or on signage.		1.2	Mounting and type of lights do not contribute to night sky light pollution, glare and light trespass (especially for large signage)	1.2	Construction drawing(s) of signage showing including details of light fixtures (mounting and types).	Signage Contractor Lighting Specialist
1.3	**Luminance Forecast** Luminance forecast (maximum & average) of signage façade in iso-candela (for large signage).		1.3	Maximum luminance do not exceed prescribed limit	1.3	For large signage only (exceeding $4m^2$ (a) Elevations of structure – Luminance prediction is preferred in the form of iso-candela mapping across the complete elevations or other graphic techniques that show the gradation and peaks of luminance. Alternatively, manually calculated 'sport' maximum and minimum luminance values with an average may be submitted.	Signage Contractor Lighting Specialist
1.4	**Night Sky Light Pollution** Method adopted to prevent stray light from projecting above horizon and contributing to discomfort glare (for large signage only – exceeding $4m^2$		1.4	To minimize night sky light pollution (refer Appendix C) Table C2.4 (shielding standard – good practice guide to minimize sky glow and glare) Images in last 3 pages of Appendix C (good lighting practice guide).	1.4	For large signage only (exceeding $4m^2$), concept statement on methods adopted to minimize night sky light pollution. Methods include :- (a) Shielding standard (b) Specific statement or drawing showing lamp shielding or focusing flood lights. Drawings to back-up statement may be submitted if appropriate.	Signage Contractor Lighting Specialist

Item	Description			Objective of Submission		Submission Check List	
						From Developer	Responsible person
2	**APPROVAL**			**Issuance of Approval**			
2.1	**Pre-Inspection Checklist** Checklist of submission before initiating hand-over inspection.		2.1	To ensure all times complied with before handing over inspection.	2.1	To compile and submit checklist of approvals before inspection. (a) Planning approval (b) Request for inspection.	 Signage Contractor Lighting Specialist
2.2	**Approval Inspection** Checklist for inspection. Inspection may only be carried out on large signage and unipole.		2.2	Inspection to ensure compliance to lighting approved plans, design concept and Lighting Masterplan. A checklist of inspection for Perbadanan include : (a) Visual inspection. (b) Types of luminaire (c) Check for obvious case of light trespass, glare and sky pollution. (d) Measure luminance (cd/m^2) for large signage. Smaller signage may not require inspection.	2.2	Conduct the following : (a) Visual inspection (b) Operation check (switch on all lights, switch on programmed scenes, operational check of controls etc). © Operation check (switch on all lights, switch on programmed scenes, operational check of controls etc).	 Signage Supplier Lighting Specialist Lighting Supplier or Contractor
2.3	**Pre Approval Check List** Post inspection checklist before official approval.		2.3	Final checklist before approval.	2.3	Report of Approval inspection for large signage.	Owner Lighting Supplier

POLICY 7:

Minimise night sky light pollution by requiring good lighting design practice, accurate equipment specification and concise aiming of installed lighting.

In the international arena there is a growing realisation that outdoors lighting which are not well designed (and especially over-designed) and properly installed is harmful to the nighttime environment. The nighttime skies of cities are increasing being suffused with a glow, which degrade the clarity of the night sky and the stars. Badly designed light fixtures and lighting design contribute to the spillage of lights into the nighttime sky. Associated issues include glare (which cause visual discomfort), light trespass (which intrude into the privacy of neighbouring lots) and wastage of energy which are environmental concerns.

As noted in section 1.4.4 and Appendix A (Preliminary Lighting Survey) of night time sky pollution, glare and poor lighting design are already cause for concern in Putrajaya.

Appendix C contains guidelines on good practice in minimising night time sky pollution.

Recommendations:

1. ***To comply with internationally established environmental guidelines to eliminate or limit the escape of light directed to the sky.***
2. ***To minimise the creation of glare.***
3. ***To achieve optimum lighting design quality through the appropriate selection of lighting equipment.***

POLICY 8:

Establish maximum limits on the luminance of internally and externally illuminated advertising and signage.

The Signage and Advertisement Design Guidelines for Putrajaya whole of Putrajaya are assumed to be typical for all other areas. This document defines the type of luminaires that are recommended for internal and external lighting of signage. These range from 21-watt T5 linear fluorescent lamps for internally illuminated signs to 400-watt metal halide lamps with a colour temperature of 6000 K. No indication of target surface luminance is provided.

The (Advertising) Control Policies and Guidelines – (Planning and Design Performance Requirement section – Paragraph 2.10.1 (iv) states:

'Illumination
The method of illumination of all types of signs is as an important design element. The intensity of illumination may cause visual distraction, nuisance glare or hazard. Perbadanan Putrajaya shall determine from time to time any required measures necessary to reduce possible negative impacts on adjacent building, roads or surrounding land uses.

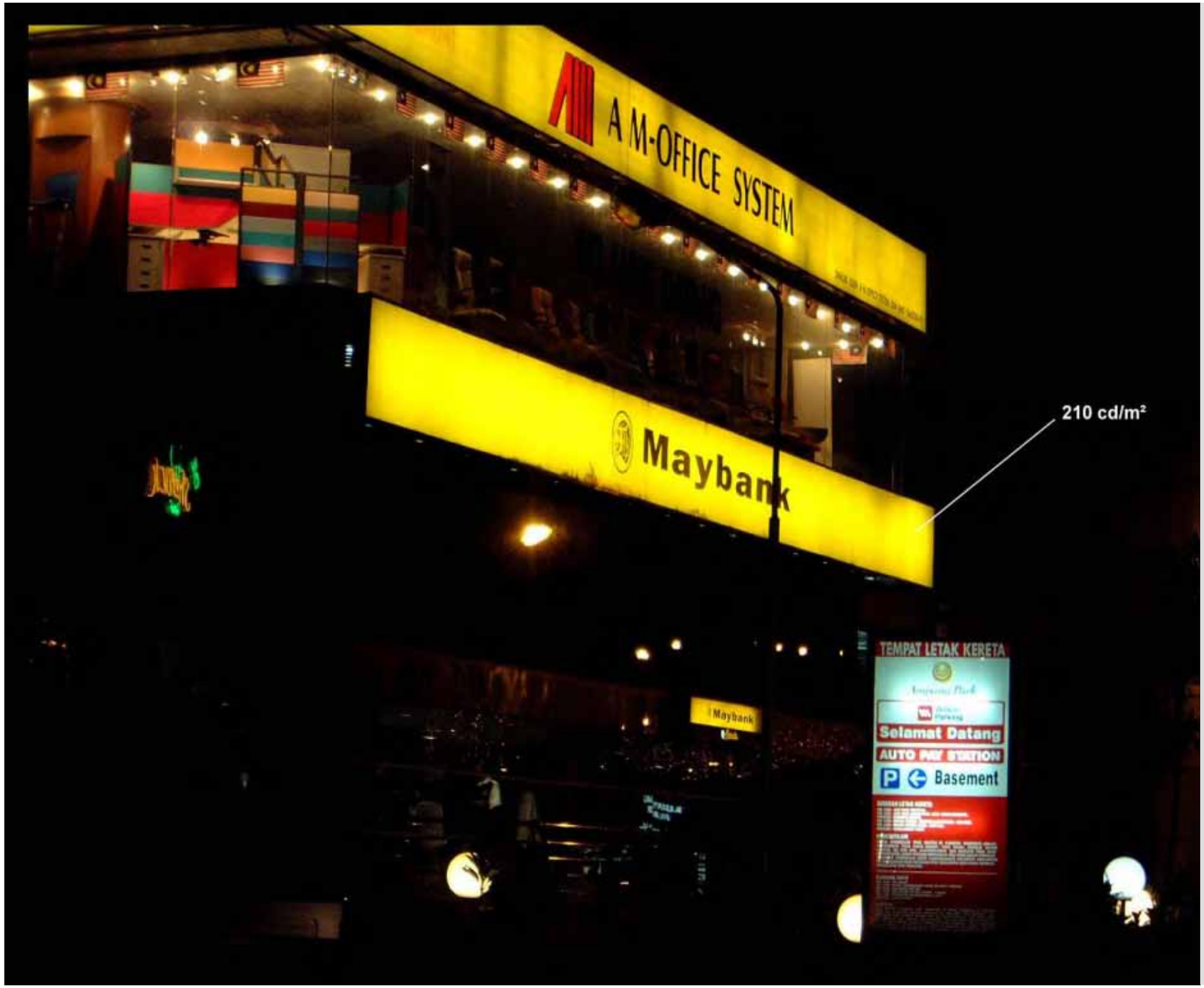
It is recommended that the maximum luminance is for internally and externally illuminated advertising and signage is as follows: -

- 200 cd/m² for Core Island (Precinct 2, 3 & 4) and Precinct 5 & 6
- 150 cd/m² for all other areas

The foregoing luminance value are the maximum value. This should be considered within the context of the lighting levels relating to the surround of the signage. A sensitive approach should be adopted to achieve a satisfactory balance between the brightness of the signage and that of its surrounding.

Recommendations:

1. ***To ensure that the brightness of illuminated advertising is controlled in relation to the brightness of surrounding lighting elements.***



Advertising Signage – Good Example

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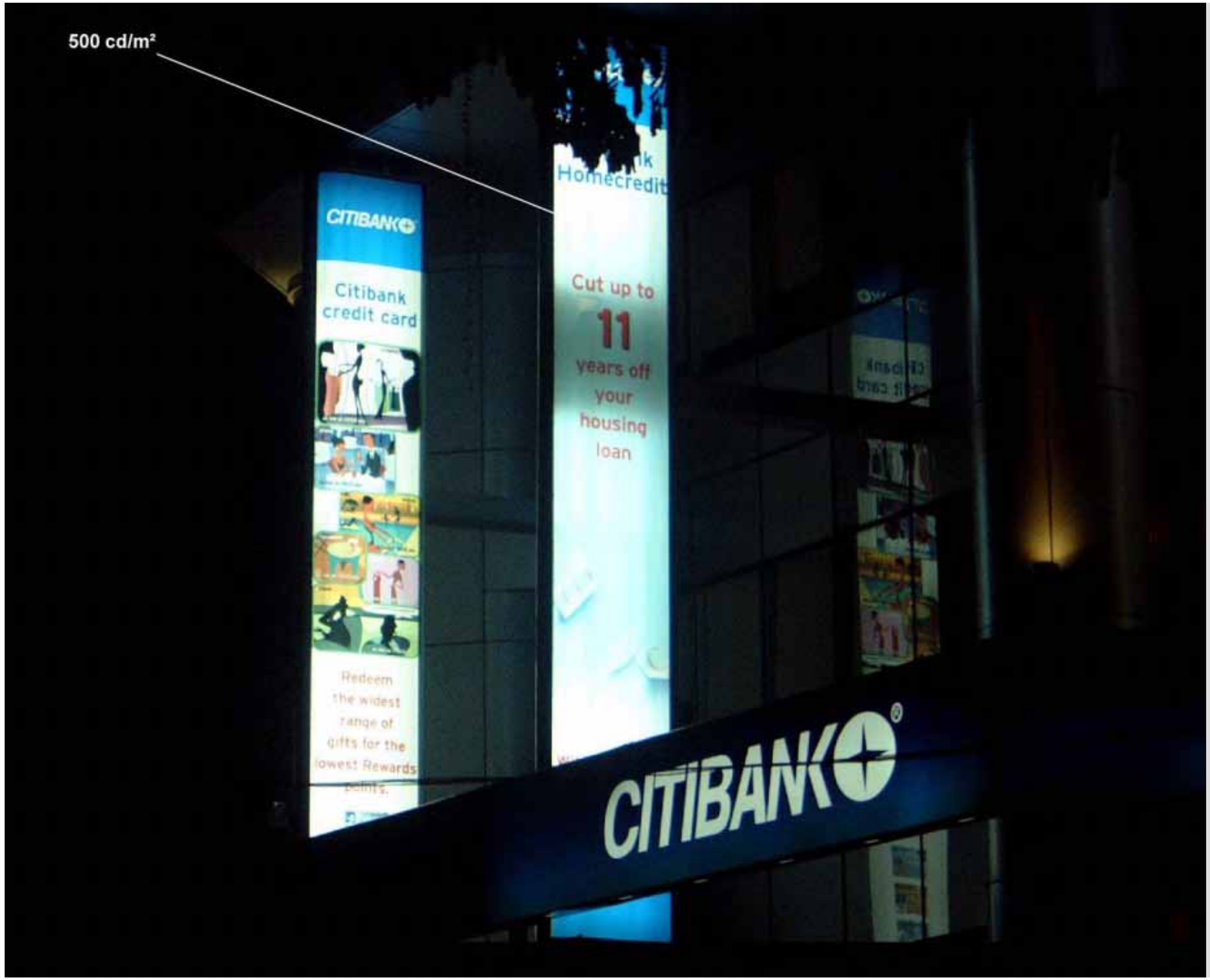
Figure 2.1.8



Advertising Signage –Bad Example

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Figure 2.1.8

POLICY 9:

In residential areas street lighting columns should be of a height that is sympathetic to the scale of adjacent buildings but should not, under any circumstance, be higher than the height of such buildings.

Policy Objectives:

1. To minimise light trespass to the interior areas of private residences that bound the street. This is particularly aimed at ensuring that street lighting does not excessively intrude into the upper windows of residences which are normally those associated with bedrooms.

2. To create a sense of domestic residential scale in areas of low rise dwellings

3. To minimise glare created by street lighting.

It is recognised that the use of lower height columns is commensurate with tighter centre-to-centre spacing of columns. It is also commensurate with the use of lower wattage light sources at each column position. The increase in the number of columns within a given length of street is justified in relation to achieving the foregoing objectives.

Generally, streets in low-rise residential areas should be lit from 6 - 9 metre columns whilst those in high-rise residential areas can continue to be lit from 12 metre columns, as is the case throughout the initially established residential areas.

Central Boulevard Looking South From Dataran Putrajaya

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Figure 2.1.8

Typical Luminance Prediction

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Figure 2.1.8