

**Wind Tunnel Study Model
Revised Landscaping with Pergola**

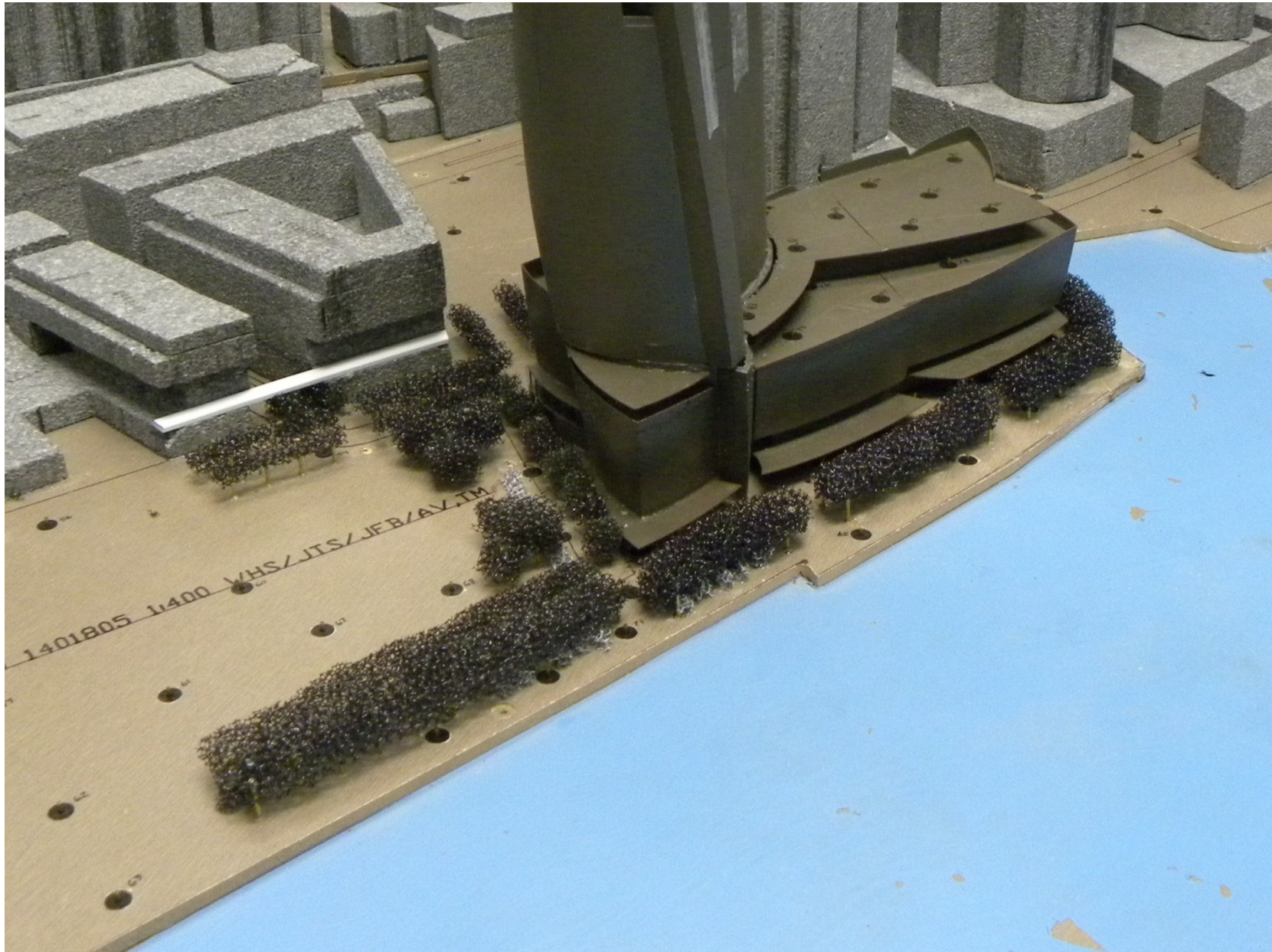
Crown Tower – Sydney, Australia

Figure No. 1d

Project #1401805

Date: July 18, 2014





Wind Tunnel Study Model
Revised Landscaping with Underplanting

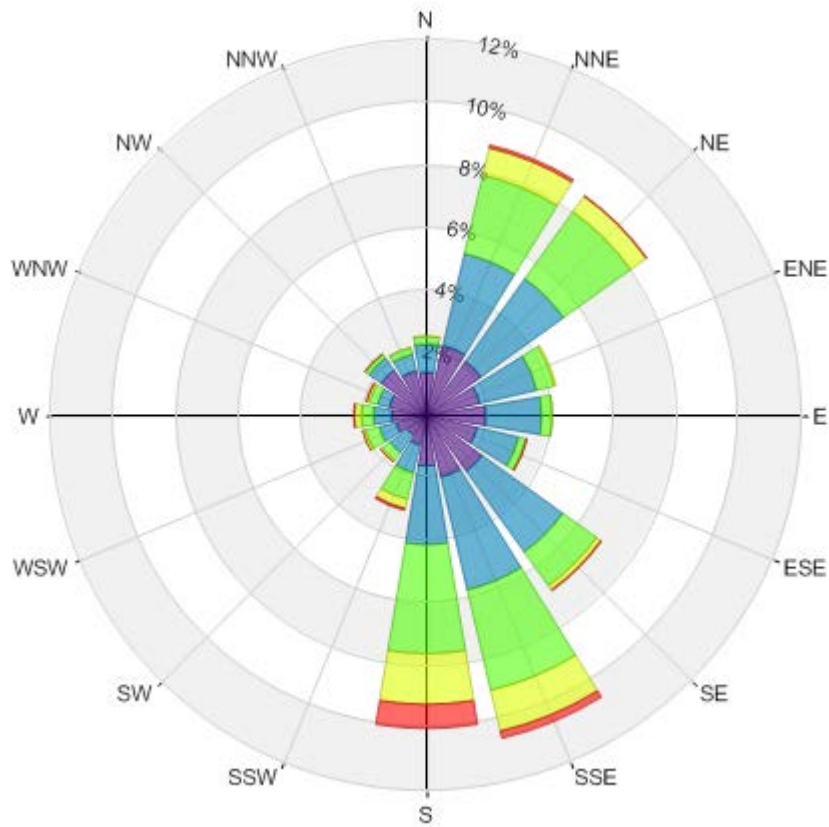
Crown Tower – Sydney, Australia

Figure No. 1e

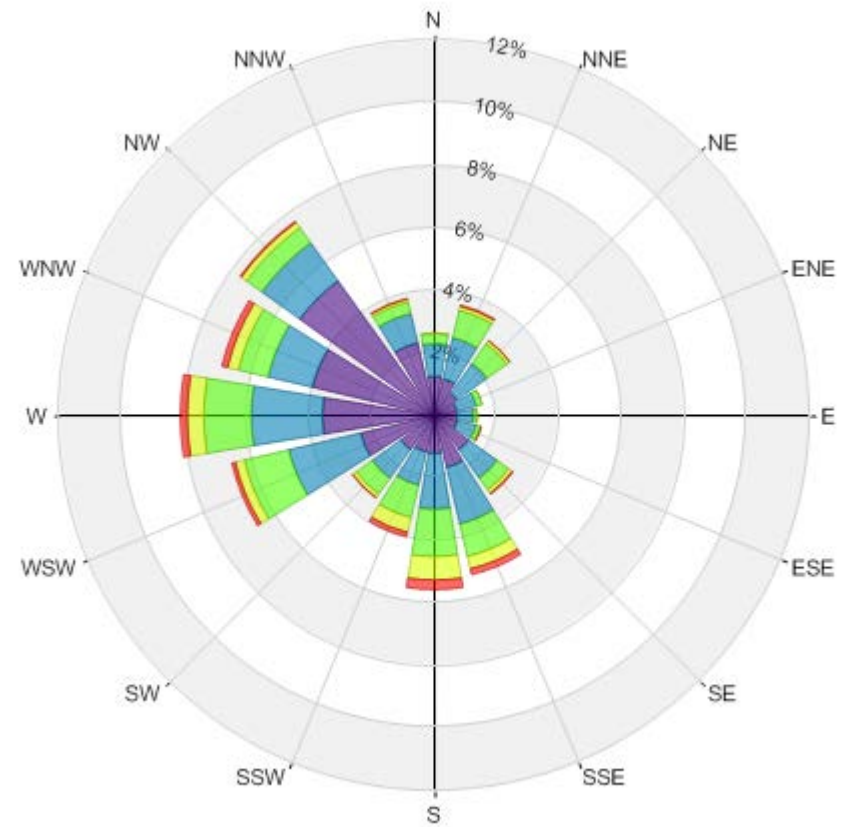
Date: July 18, 2014



Project #1401805



Summer
(November - April)



Winter
(May - October)

Wind Speed (km/h)	Probability (%)	
	Summer	Winter
Calm	24.9	32.0
1-10	25.2	30.0
11-20	25.7	20.9
21-30	17.3	12.1
31-40	5.5	3.7
>40	1.3	1.3

**Directional Distribution (%) of Winds (Blowing From)
Sydney Airport (1985 - 1993)**

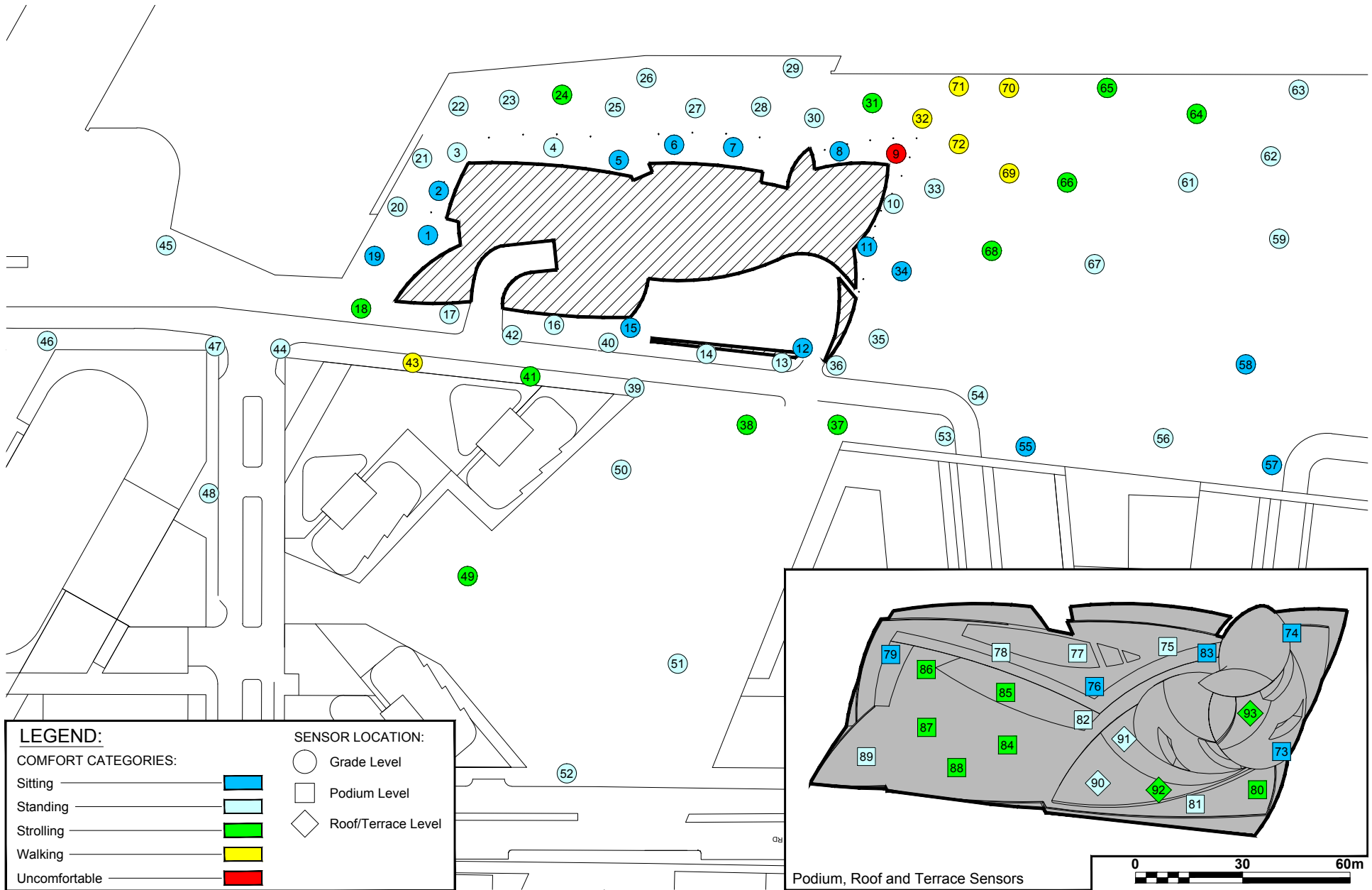
Crown Tower – Sydney, Australia

Figure No. 2

Project #1401805

Date: June 24, 2014





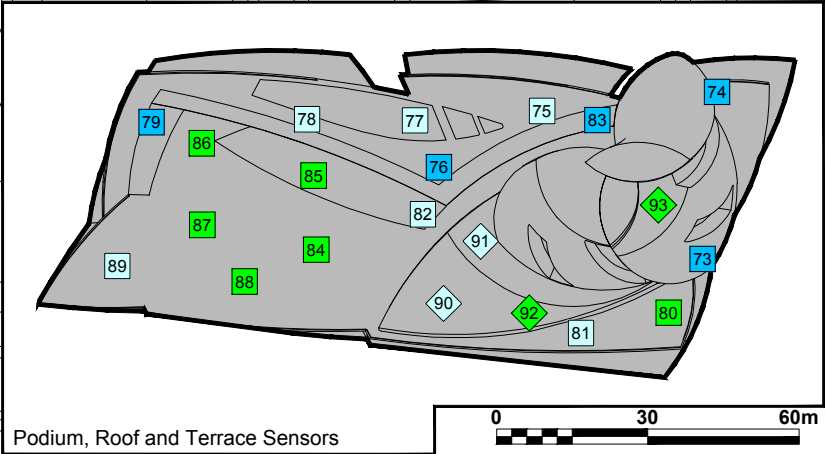
LEGEND:

COMFORT CATEGORIES:

Sitting	Blue
Standing	Light Blue
Strolling	Green
Walking	Yellow
Uncomfortable	Red

SENSOR LOCATION:

○	Grade Level
□	Podium Level
◇	Roof/Terrace Level



Pedestrian Wind Comfort Conditions - No Landscaping
 Summer (November to April, 6:00 to 23:00)

Crown Tower - Sydney, Australia



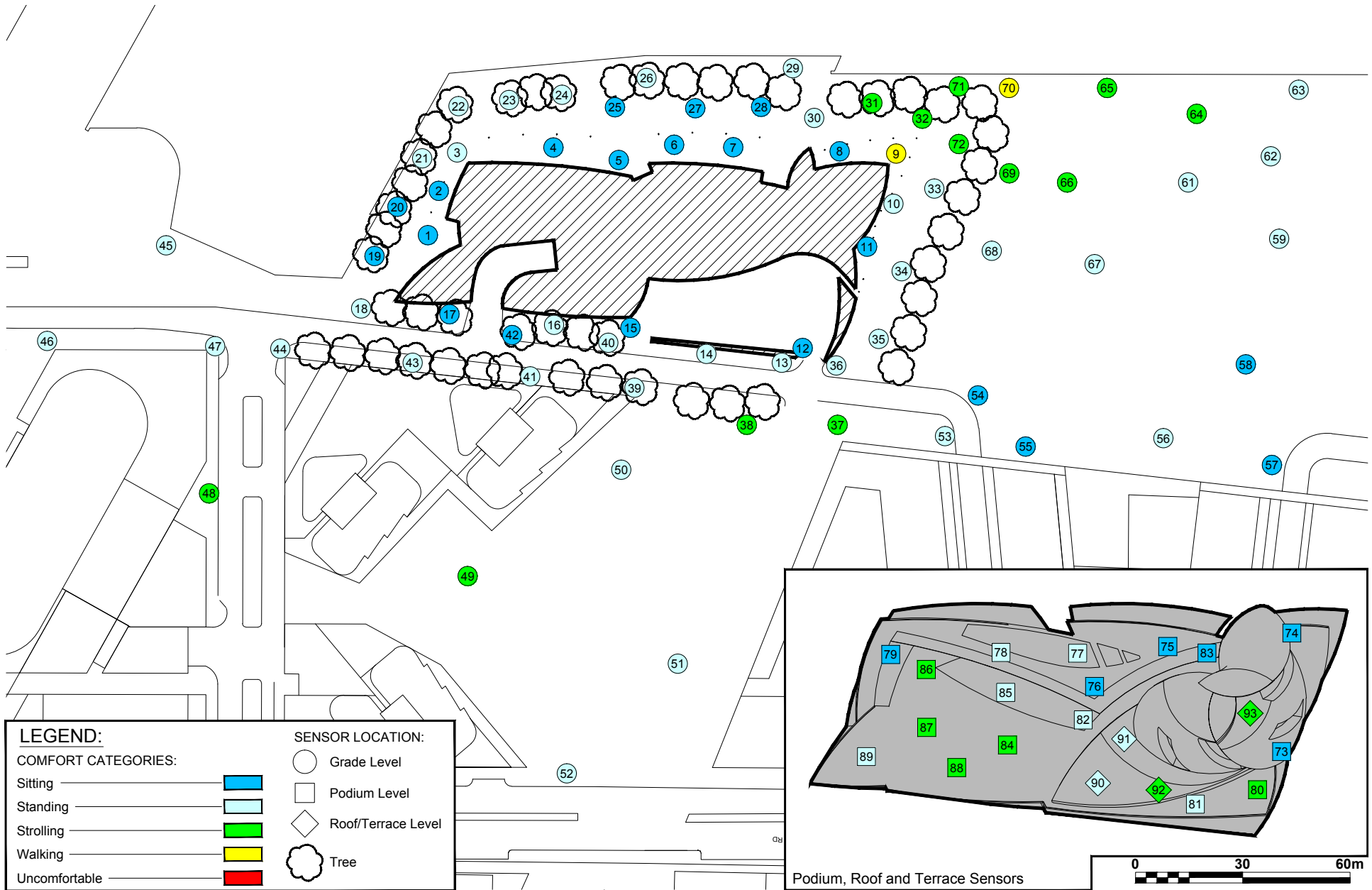
Drawn by: MDN Figure: 3a

Approx. Scale: 1:1500

Date Revised: June 24, 2014

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Pedestrian Wind Comfort Conditions - Landscaping
 Summer (November to April, 6:00 to 23:00)

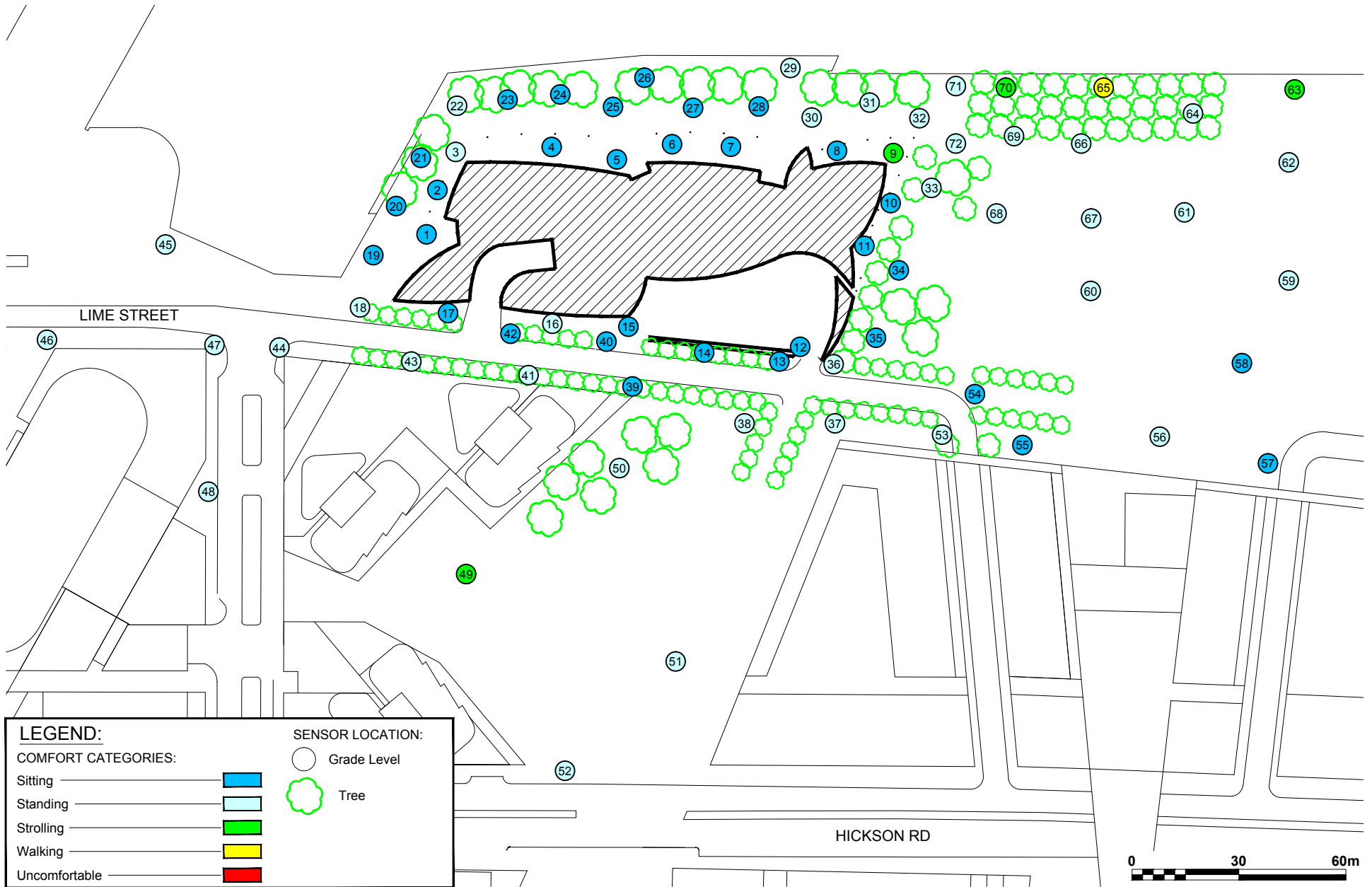
Crown Tower - Sydney, Australia



Drawn by: MDN	Figure: 3b
Approx. Scale: 1:1500	
Date Revised: June 24, 2014	

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LEGEND:

COMFORT CATEGORIES:

Sitting	
Standing	
Strolling	
Walking	
Uncomfortable	

SENSOR LOCATION:

	Grade Level
	Tree

Pedestrian Wind Comfort Conditions - Revised Landscaping Plan
 Summer (November to April, 6:00 to 23:00)

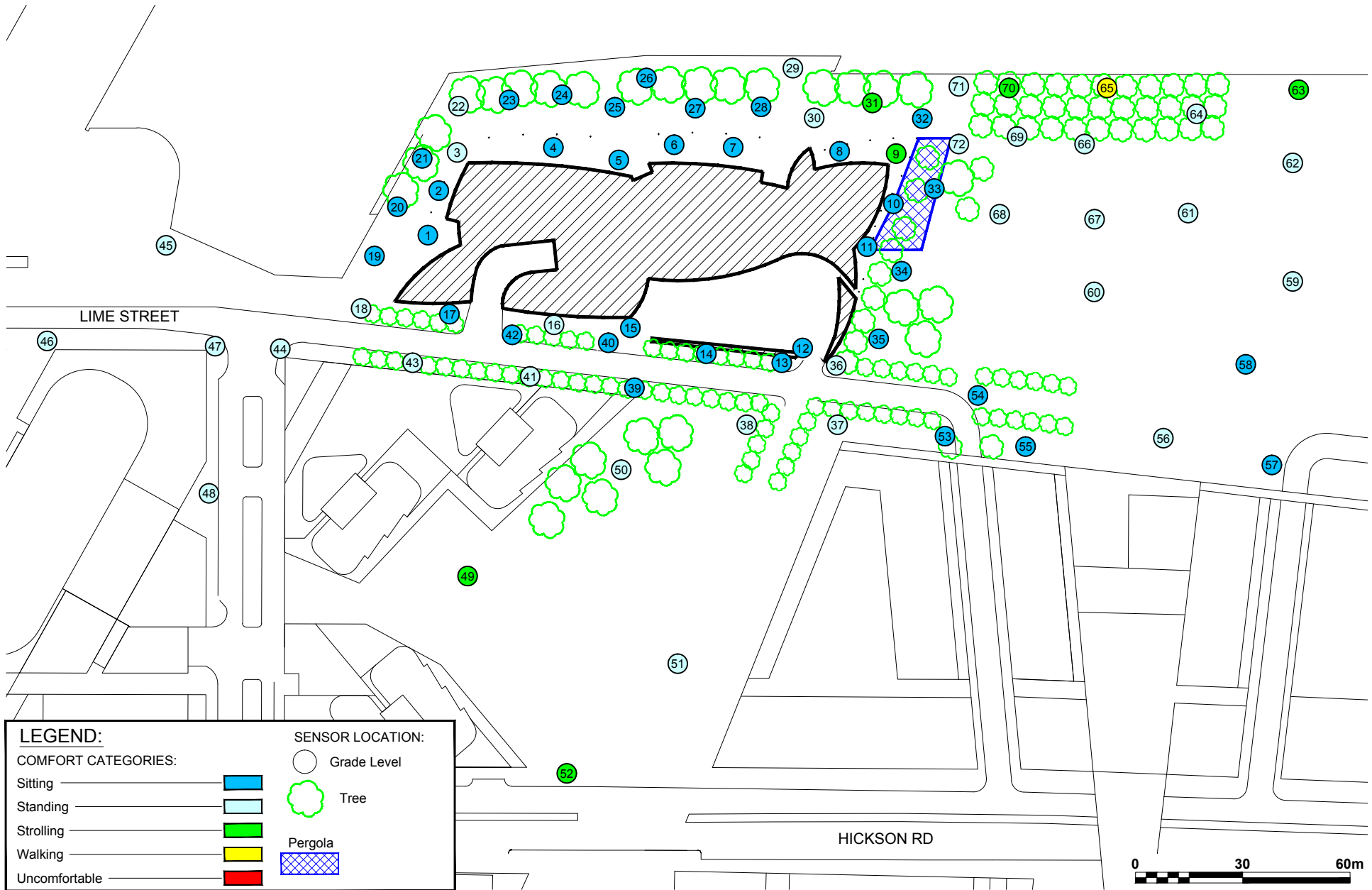
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Drawn by: ARM	Figure: 3C
Approx. Scale: 1:1500	
Date Revised: July 18, 2014	



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LEGEND:

COMFORT CATEGORIES:

- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

SENSOR LOCATION:

- Grade Level
- Tree
- Pergola

Pedestrian Wind Comfort Conditions - Revised Landscaping with Pergola
 Summer (November to April, 6:00 to 23:00)

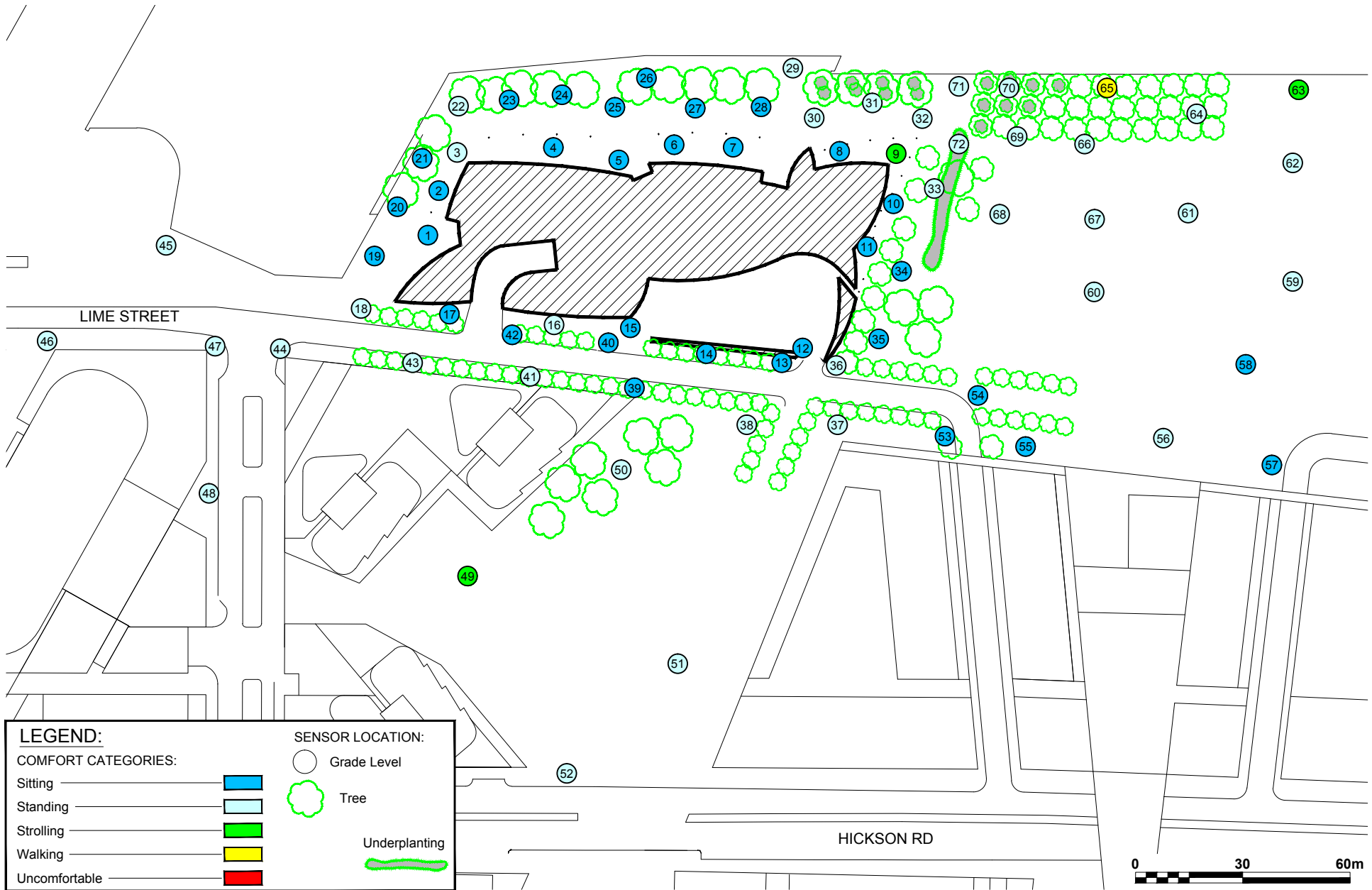
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Drawn by: ARM	Figure: 3d
Approx. Scale: 1:1500	
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Pedestrian Wind Comfort Conditions - Revised Landscaping Plan with Underplanting
 Summer (November to April, 6:00 to 23:00)

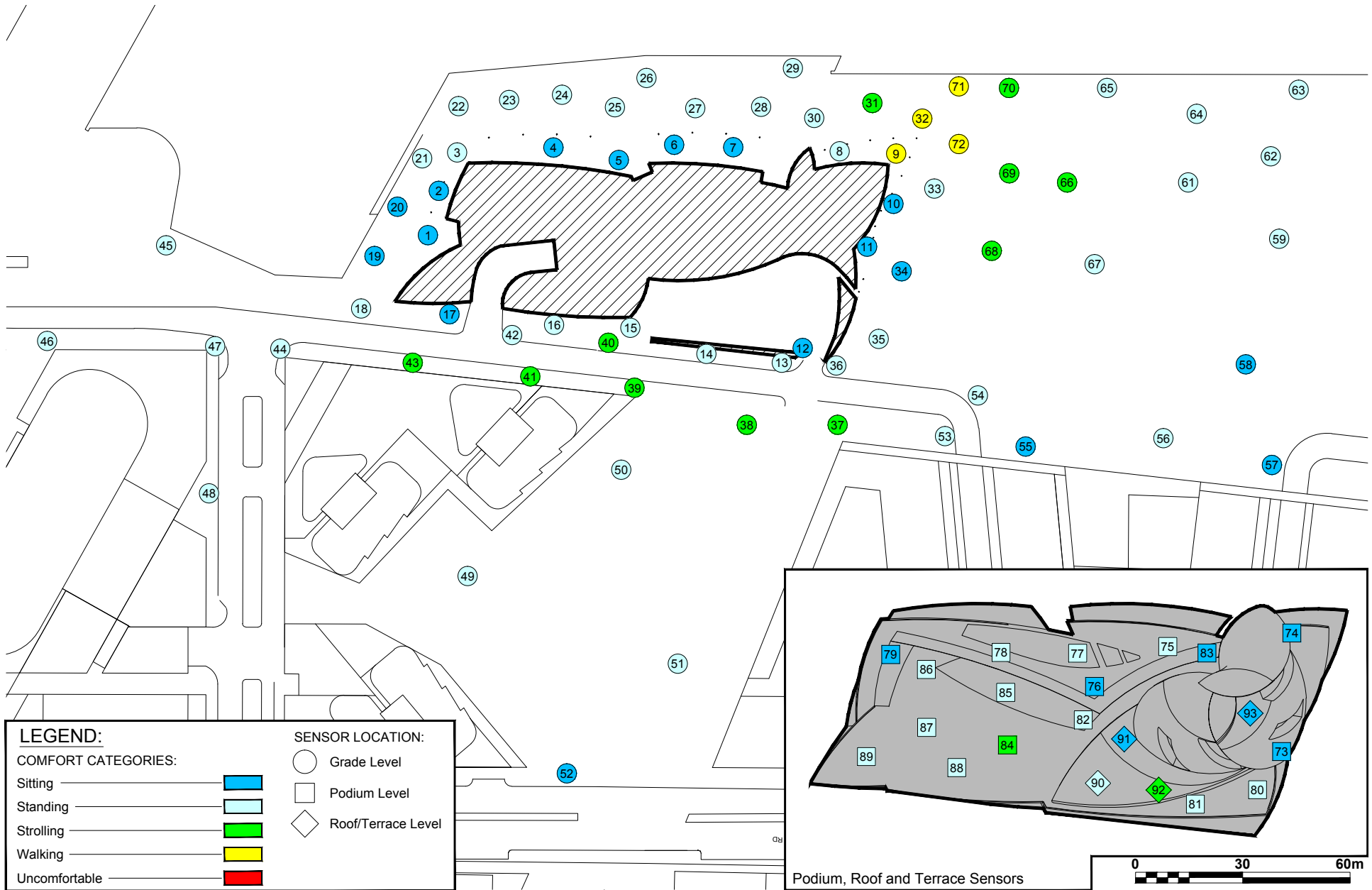
Crown Tower - Sydney, Australia



Drawn by: ARM Figure: 3e
 Approx. Scale: 1:1500
 Date Revised: July 18, 2014

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LEGEND:

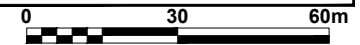
COMFORT CATEGORIES:

- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

SENSOR LOCATION:

- Grade Level
- Podium Level
- Roof/Terrace Level

Podium, Roof and Terrace Sensors



Pedestrian Wind Comfort Conditions - No Landscaping
 Winter (May to October, 6:00 to 23:00)

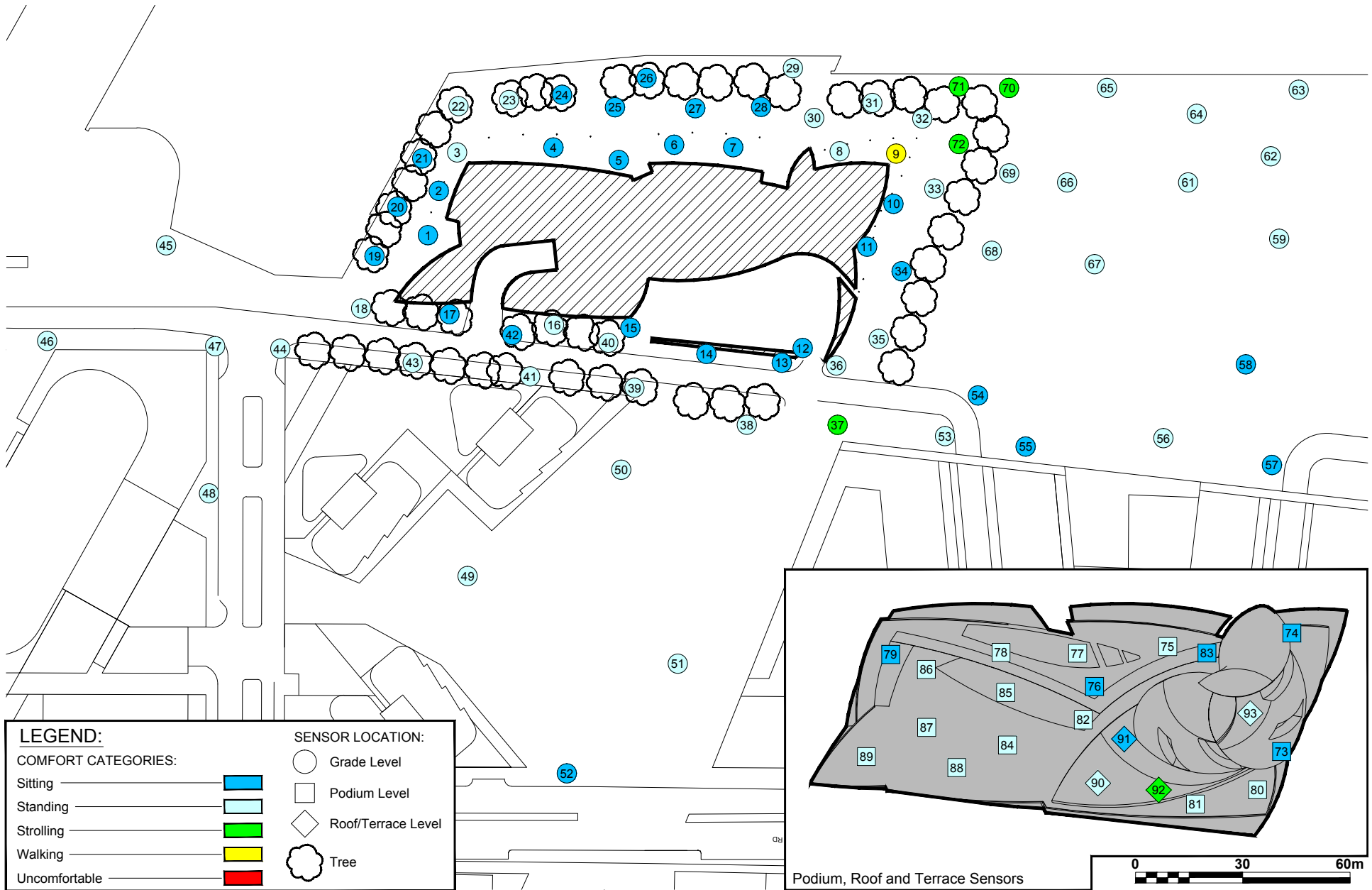
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Drawn by: MDN Figure: **4a**
 Approx. Scale: 1:1500
 Date Revised: June 24, 2014

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Pedestrian Wind Comfort Conditions - Landscaping
 Winter (May to October, 6:00 to 23:00)

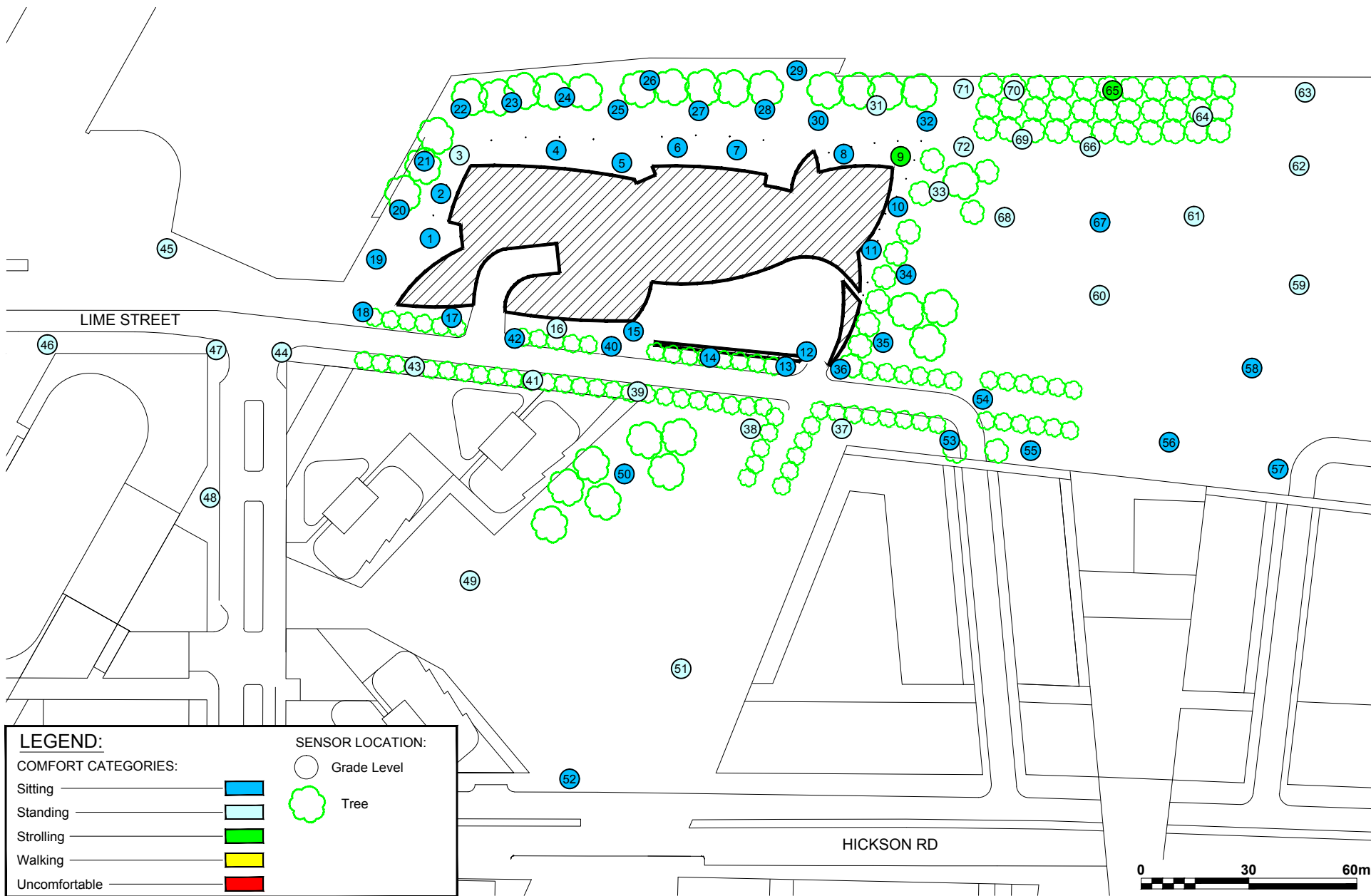
Crown Tower - Sydney, Australia



Drawn by: MDN | Figure: 4b
 Approx. Scale: 1:1500
 Date Revised: June 24, 2014

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LEGEND:

COMFORT CATEGORIES:

Sitting	
Standing	
Strolling	
Walking	
Uncomfortable	

SENSOR LOCATION:

	Grade Level
	Tree

Pedestrian Wind Comfort Conditions - Revised Landscaping Plan
 Winter (May to October, 6:00 to 23:00)

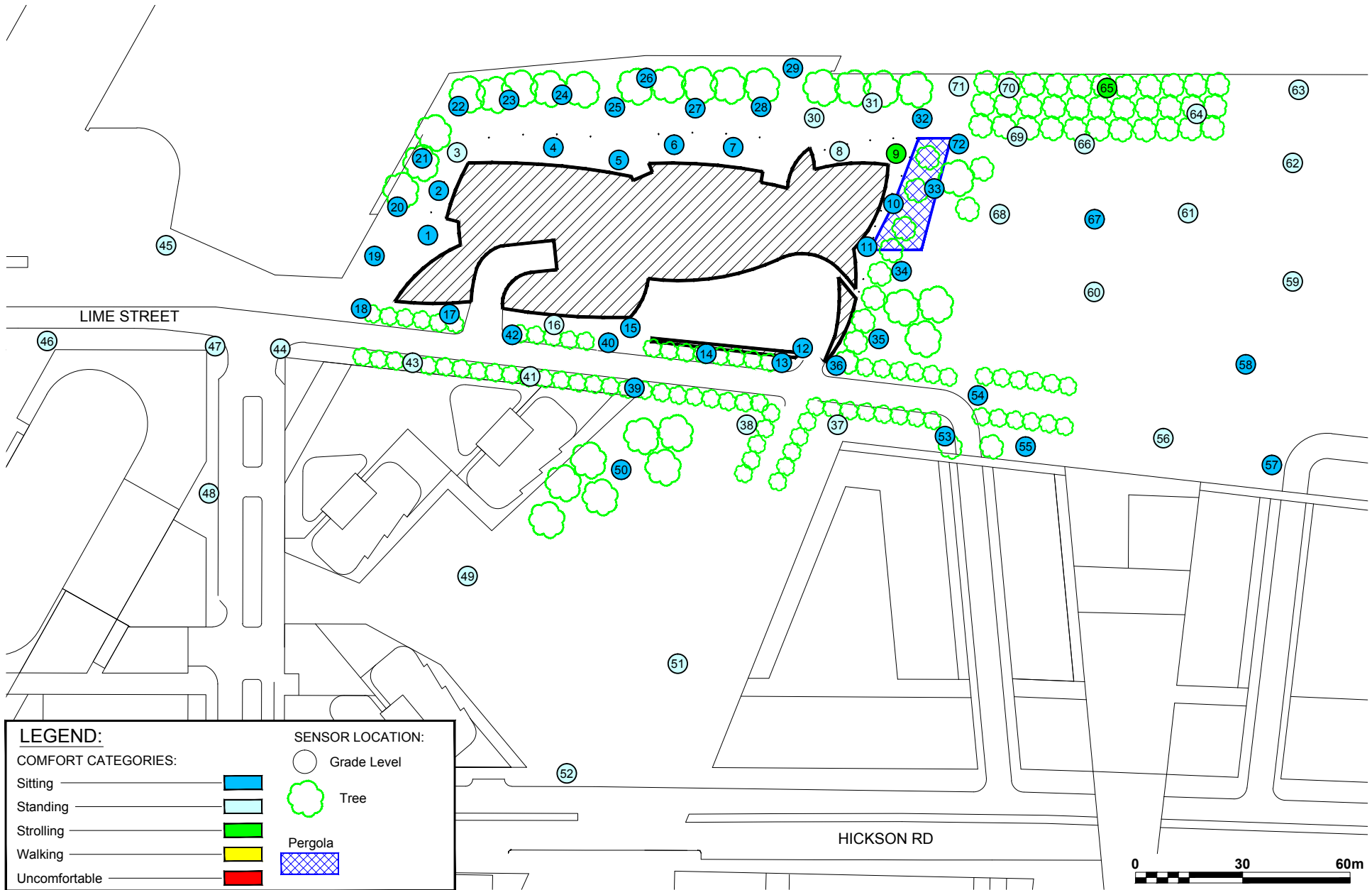
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Drawn by: ARM	Figure: 4C
Approx. Scale: 1:1500	
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Pedestrian Wind Comfort Conditions - Revised Landscaping with Pergola
 Winter (May to October, 6:00 to 23:00)

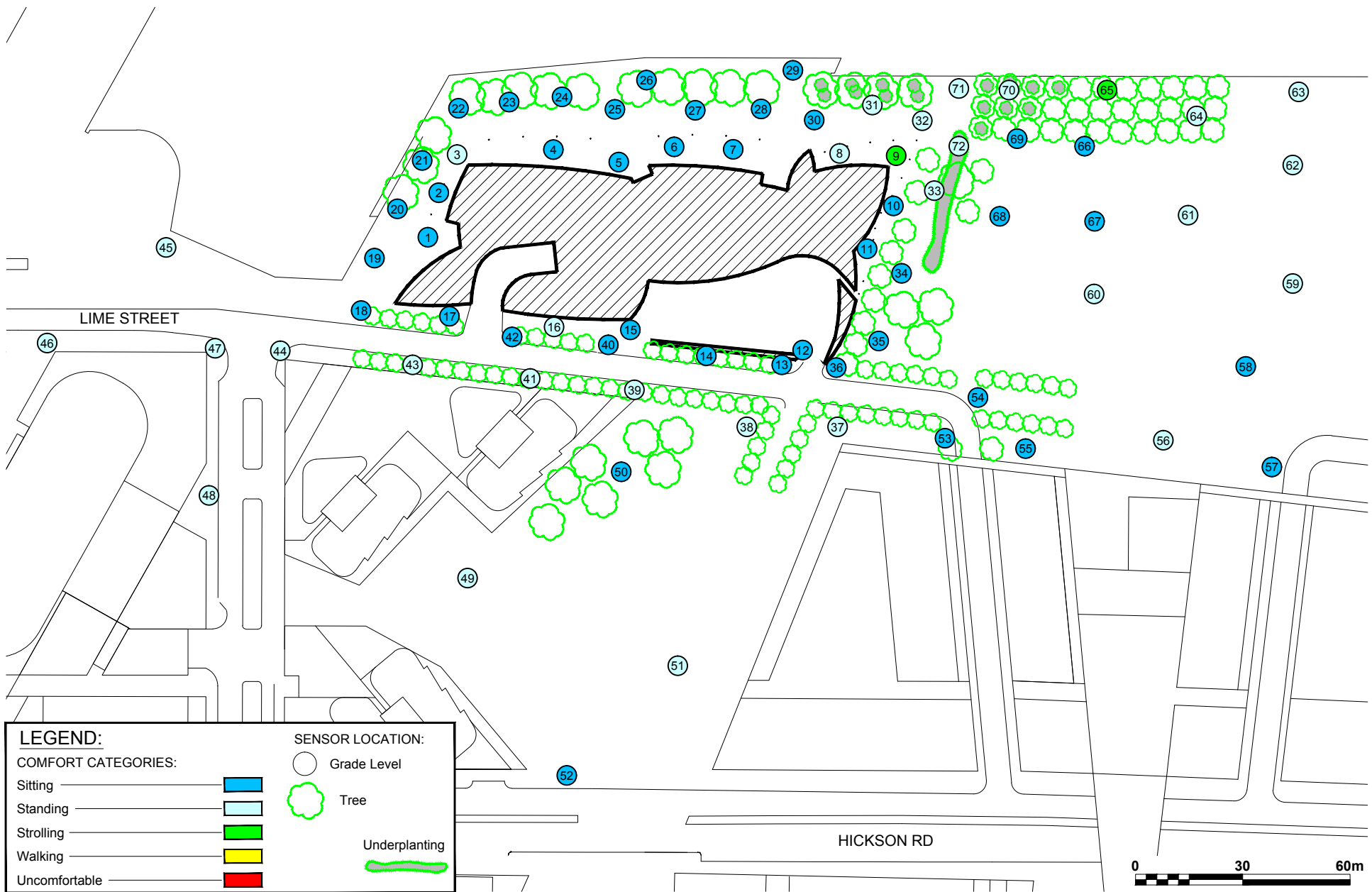
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Drawn by: ARM Figure: 4d
 Approx. Scale: 1:1500
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LEGEND:

COMFORT CATEGORIES:


Sitting	Blue
Standing	Light Blue
Strolling	Green
Walking	Yellow
Uncomfortable	Red

SENSOR LOCATION:


Grade Level	White Circle
Tree	Green Tree Symbol
Underplanting	Green Hatched Area

Pedestrian Wind Comfort Conditions - Revised Landscaping Plan with Underplanting
 Winter (May to October, 6:00 to 23:00)

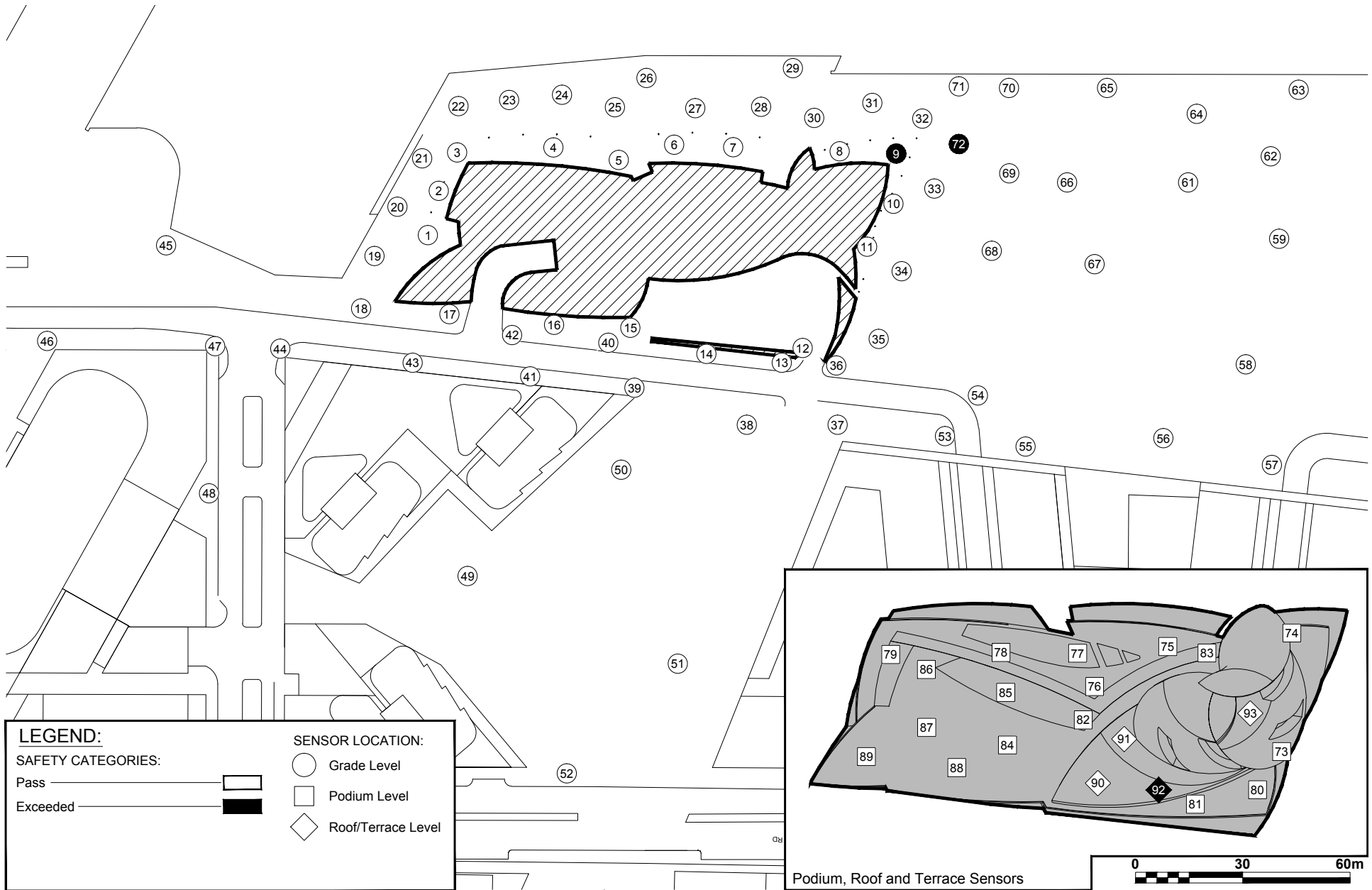
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True North 

Drawn by: ARM	Figure: 4e
Approx. Scale: 1:1500	
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LEGEND:


SAFETY CATEGORIES:


Pass 

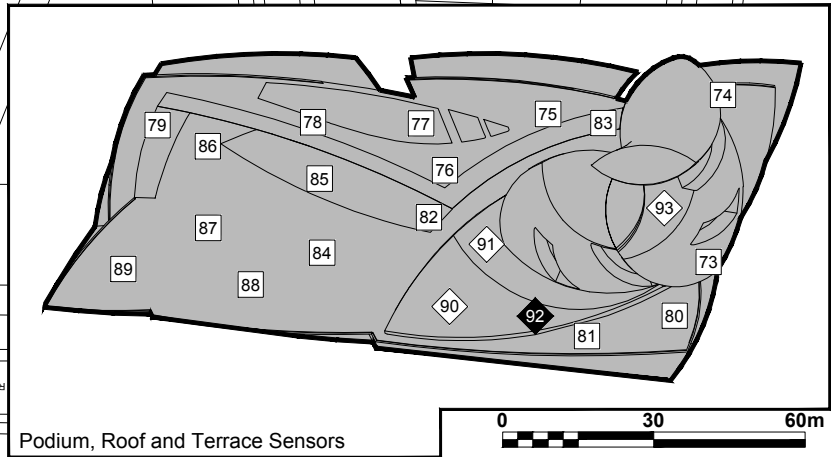
Exceeded 

SENSOR LOCATION:

 Grade Level

 Podium Level

 Roof/Terrace Level



Pedestrian Wind Safety Conditions - No Landscaping
 Annual (January to December, 0:00 to 23:00)

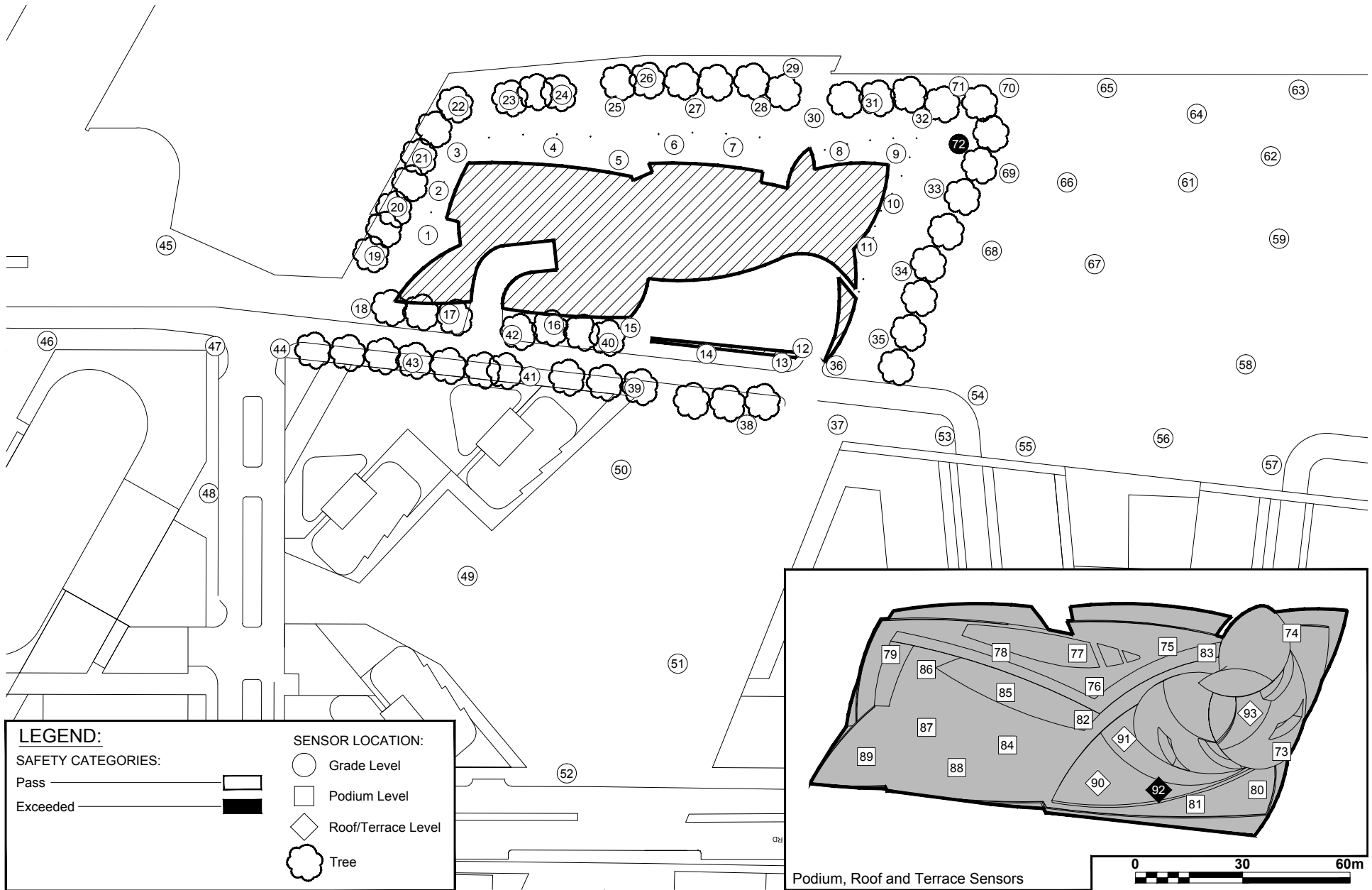
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Drawn by: MDN	Figure: 5a
Approx. Scale: 1:1500	
Date Revised: June 24, 2014	


Project #1401805










LEGEND:

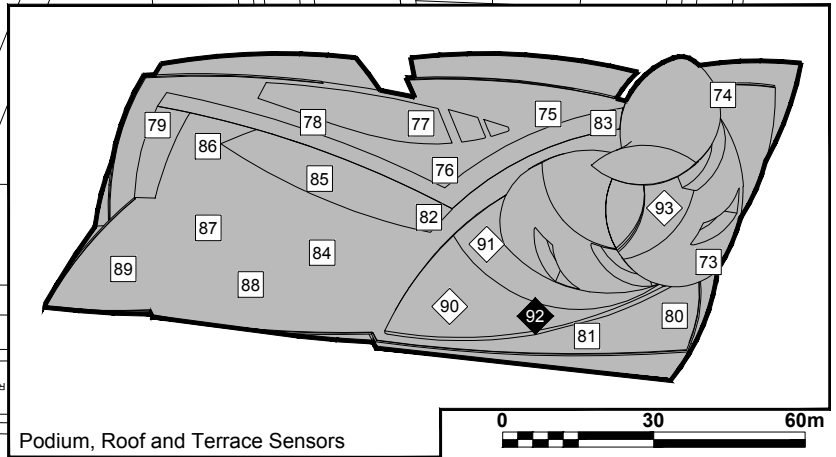
SAFETY CATEGORIES:

Pass 

Exceeded 

SENSOR LOCATION:

-  Grade Level
-  Podium Level
-  Roof/Terrace Level
-  Tree



Pedestrian Wind Safety Conditions - Landscaping
 Annual (January to December, 0:00 to 23:00)

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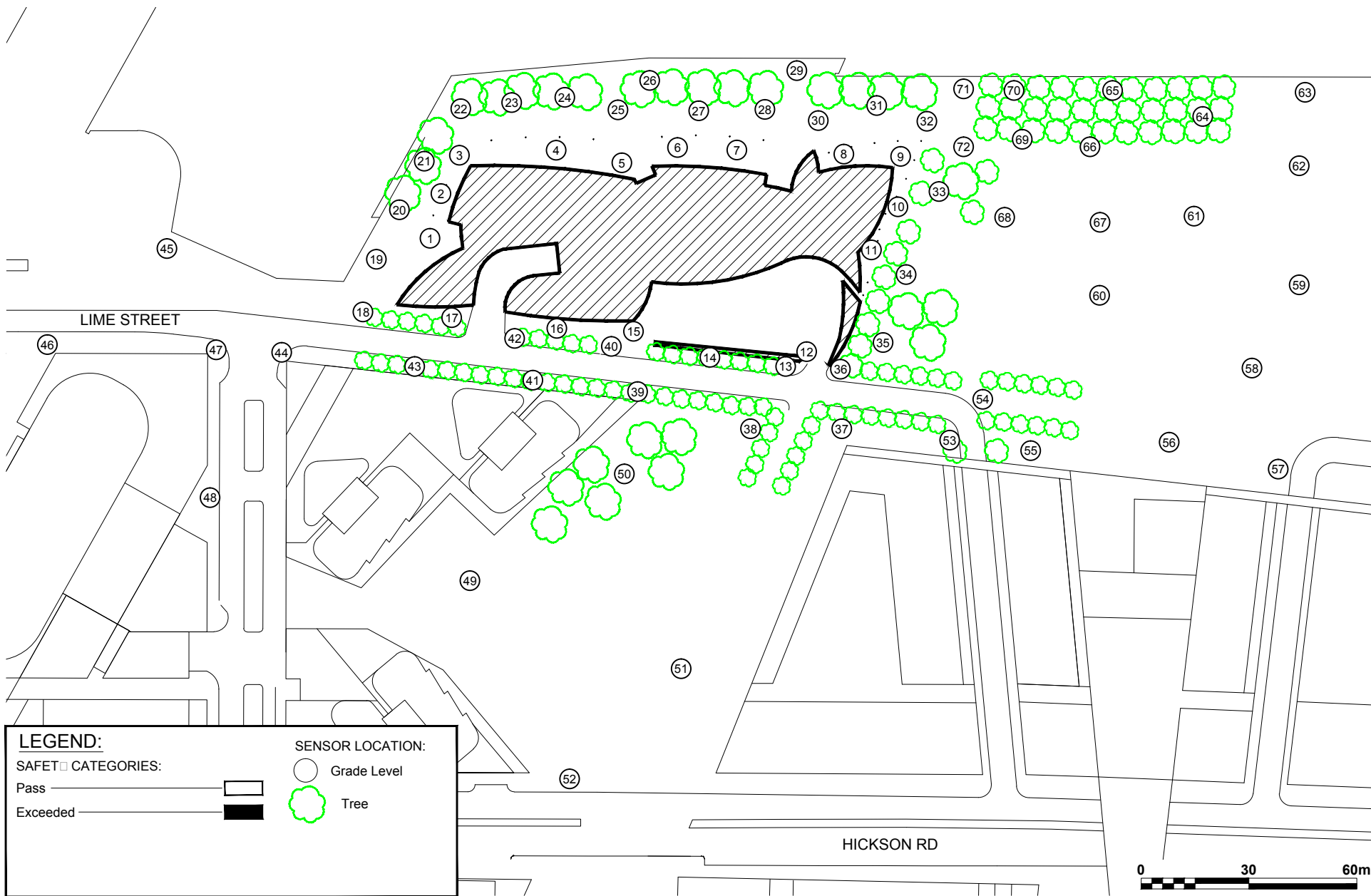
Drawn by: MDN Figure: **5b**

Approx. Scale: 1:1500

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Pedestrian Wind Safety Conditions - Revised Landscaping Plan
 Annual (January to December, 0:00 to 23:00)

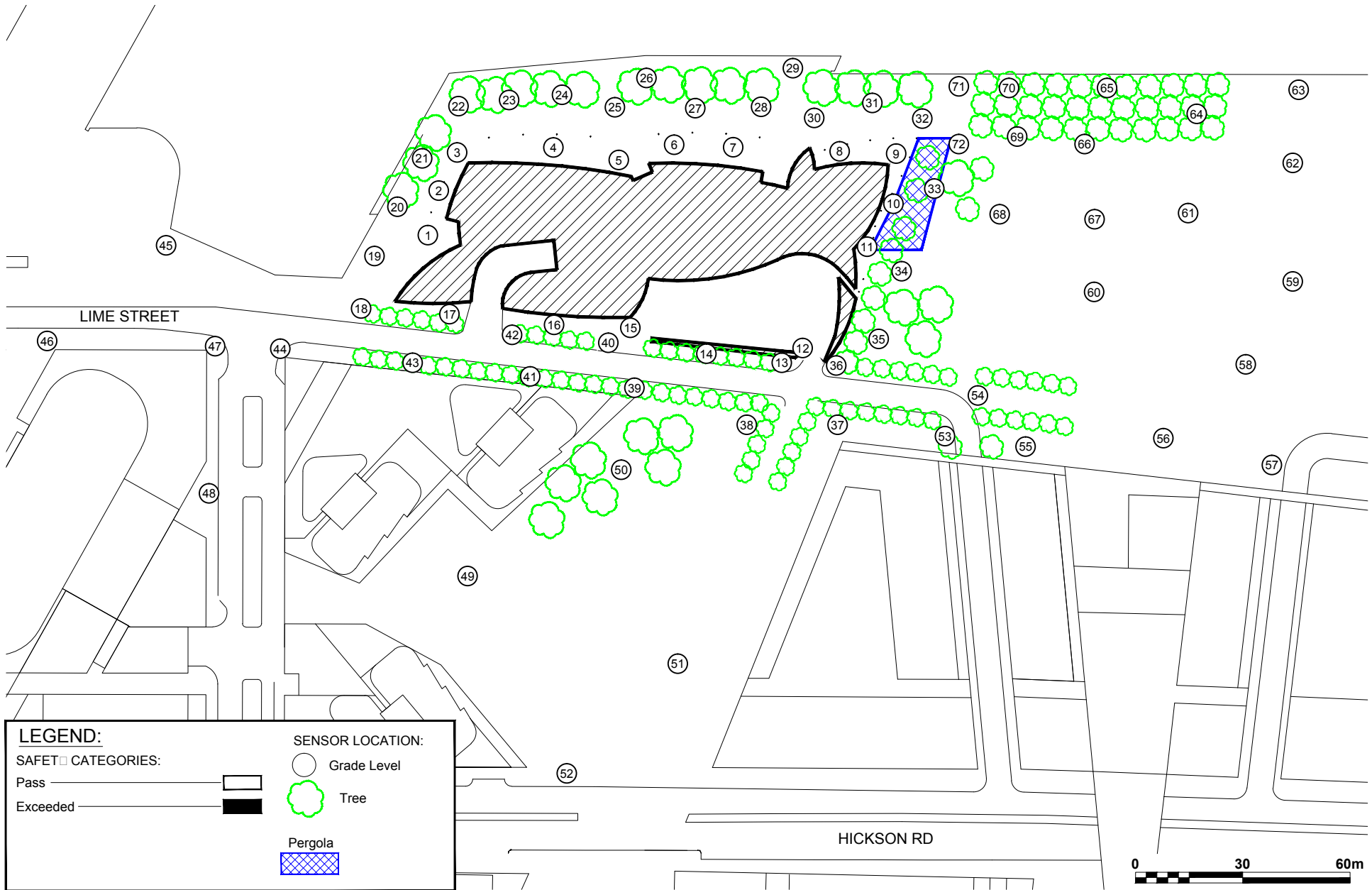
Crown Tower - Sydney, Australia



Drawn by: ARM	Figure: 5c
Approx. Scale: 1:1500	
Date Revised: July 18, 2014	


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LEGEND:


SAFETY CATEGORIES:


Pass 

Exceeded 

SENSOR LOCATION:

 Grade Level

 Tree

 Pergola

Pedestrian Wind Safety Conditions - Landscaping with Pergola
 Annual (January to December, 0:00 to 23:00)

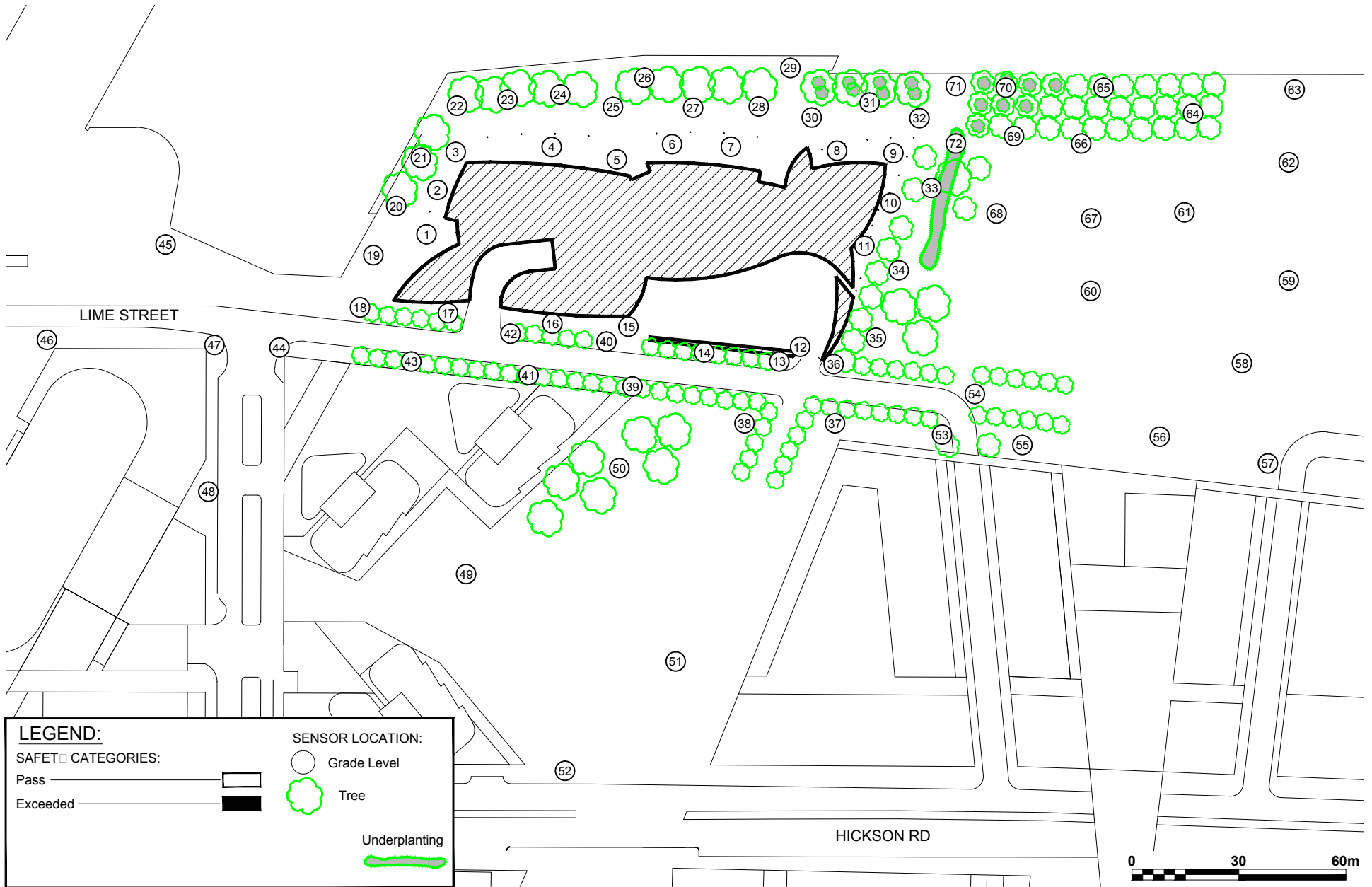
Crown Tower - Sydney, Australia



Drawn by: ARM	Figure: 5d
Approx. Scale: 1:1500	
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Pedestrian Wind Safety Conditions - Landscaping Plan with Underplanting
 Annual (January to December, 0:00 to 23:00)

Crown Tower - Sydney, Australia



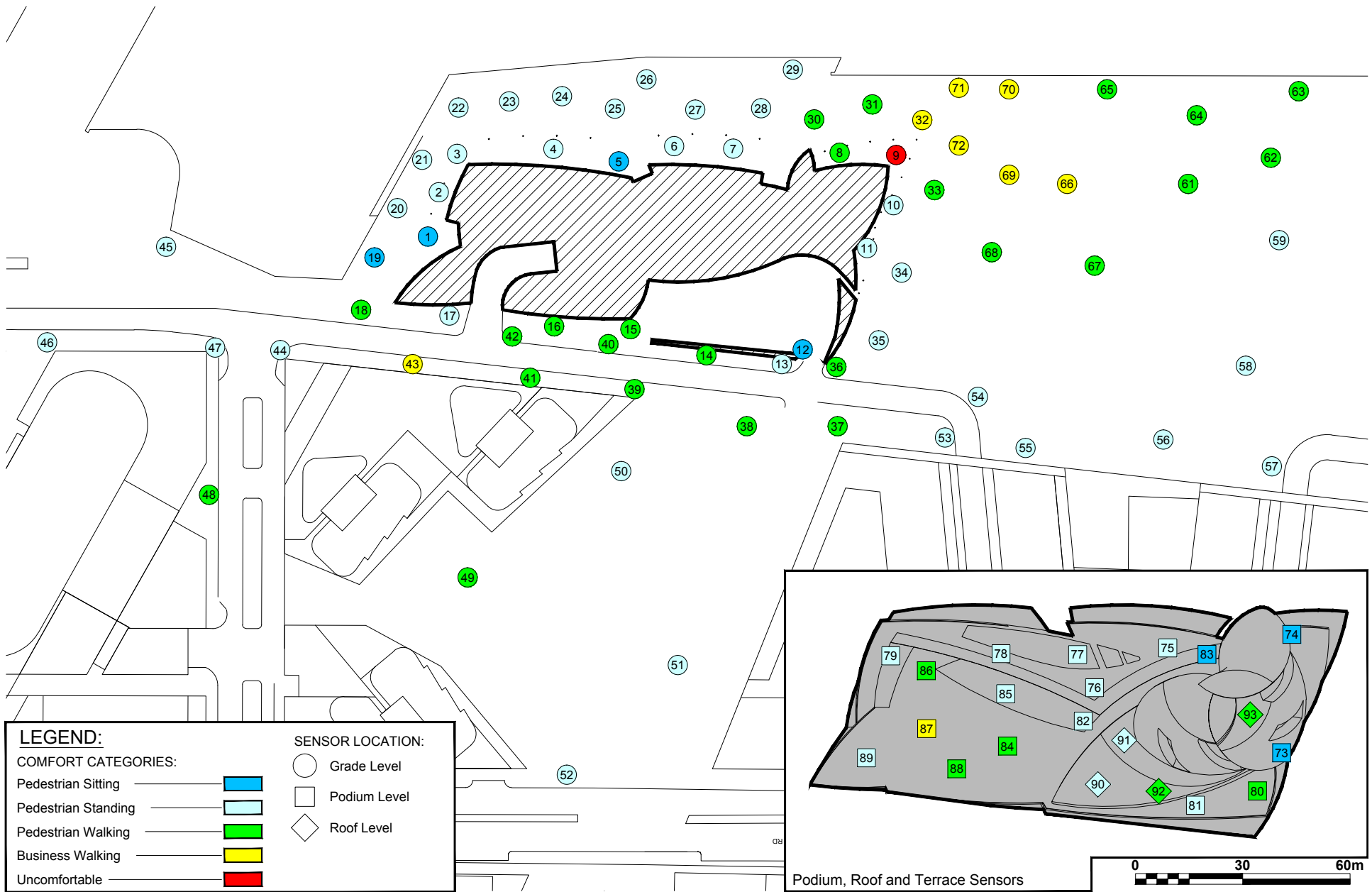
Drawn by: ARM Figure: 5e

Approx. Scale: 1:1500

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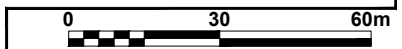
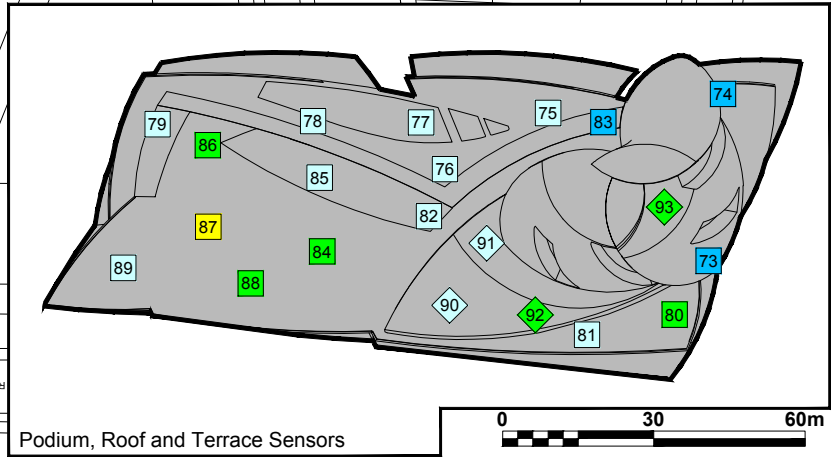
LEGEND:

COMFORT CATEGORIES:

Pedestrian Sitting	
Pedestrian Standing	
Pedestrian Walking	
Business Walking	
Uncomfortable	

SENSOR LOCATION:

	Grade Level
	Podium Level
	Roof Level



Pedestrian Wind Comfort Conditions - No Landscaping
 Spring (September to November, 0:00 to 23:00)

Crown Tower - Sydney, Australia



Drawn by: MDN Figure: 6a

Approx. Scale: 1:1500

Date Revised: June 24, 2014

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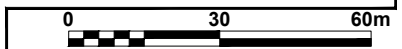
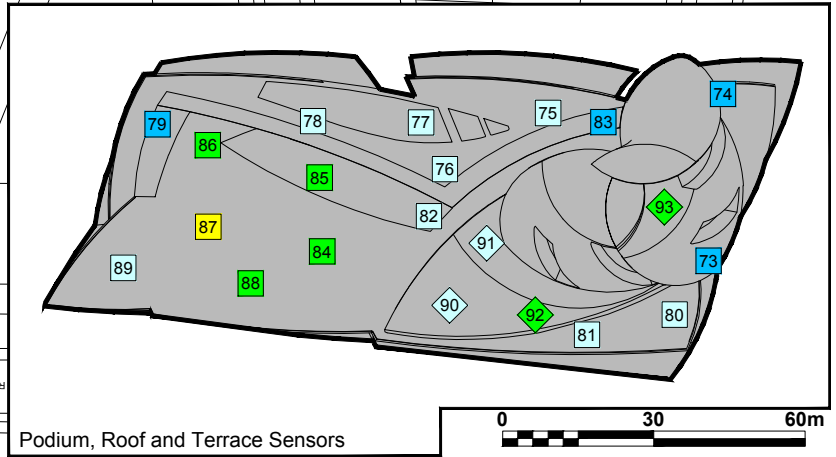
LEGEND:

COMFORT CATEGORIES:

Pedestrian Sitting	
Pedestrian Standing	
Pedestrian Walking	
Business Walking	
Uncomfortable	

SENSOR LOCATION:

	Grade Level
	Podium Level
	Roof Level
	Tree



Pedestrian Wind Comfort Conditions - Landscaping
 Spring (September to November, 0:00 to 23:00)

Crown Tower - Sydney, Australia



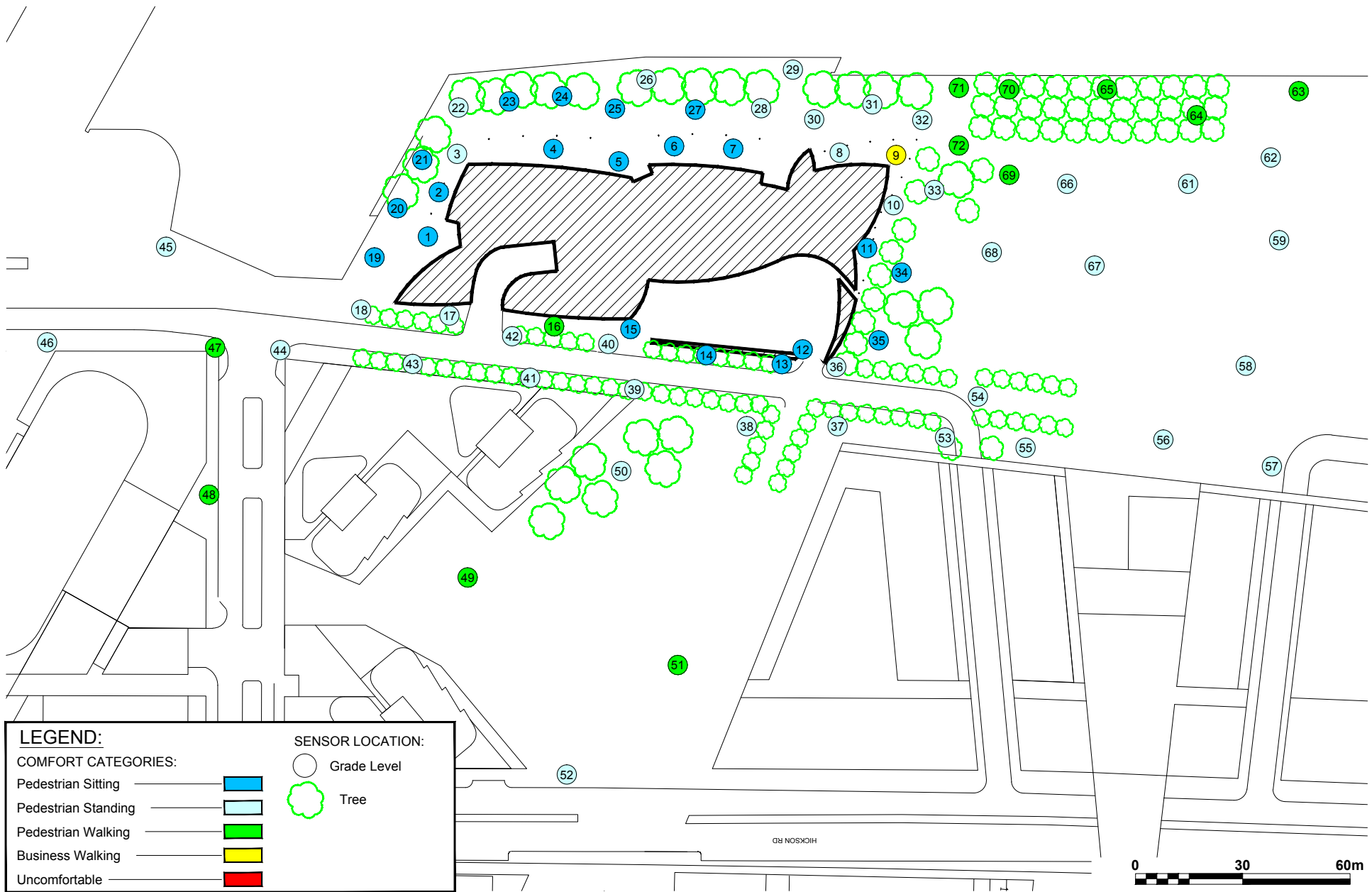
Drawn by: MDN Figure: 6b

Approx. Scale: 1:1500

Date Revised: June 24, 2014

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LEGEND:

COMFORT CATEGORIES:

Pedestrian Sitting	
Pedestrian Standing	
Pedestrian Walking	
Business Walking	
Uncomfortable	

SENSOR LOCATION:

	Grade Level
	Tree

Pedestrian Wind Comfort Conditions - Revised Landscaping Plan
 Spring (September to November, 0:00 to 23:00)
 T.V. Lawson Criteria

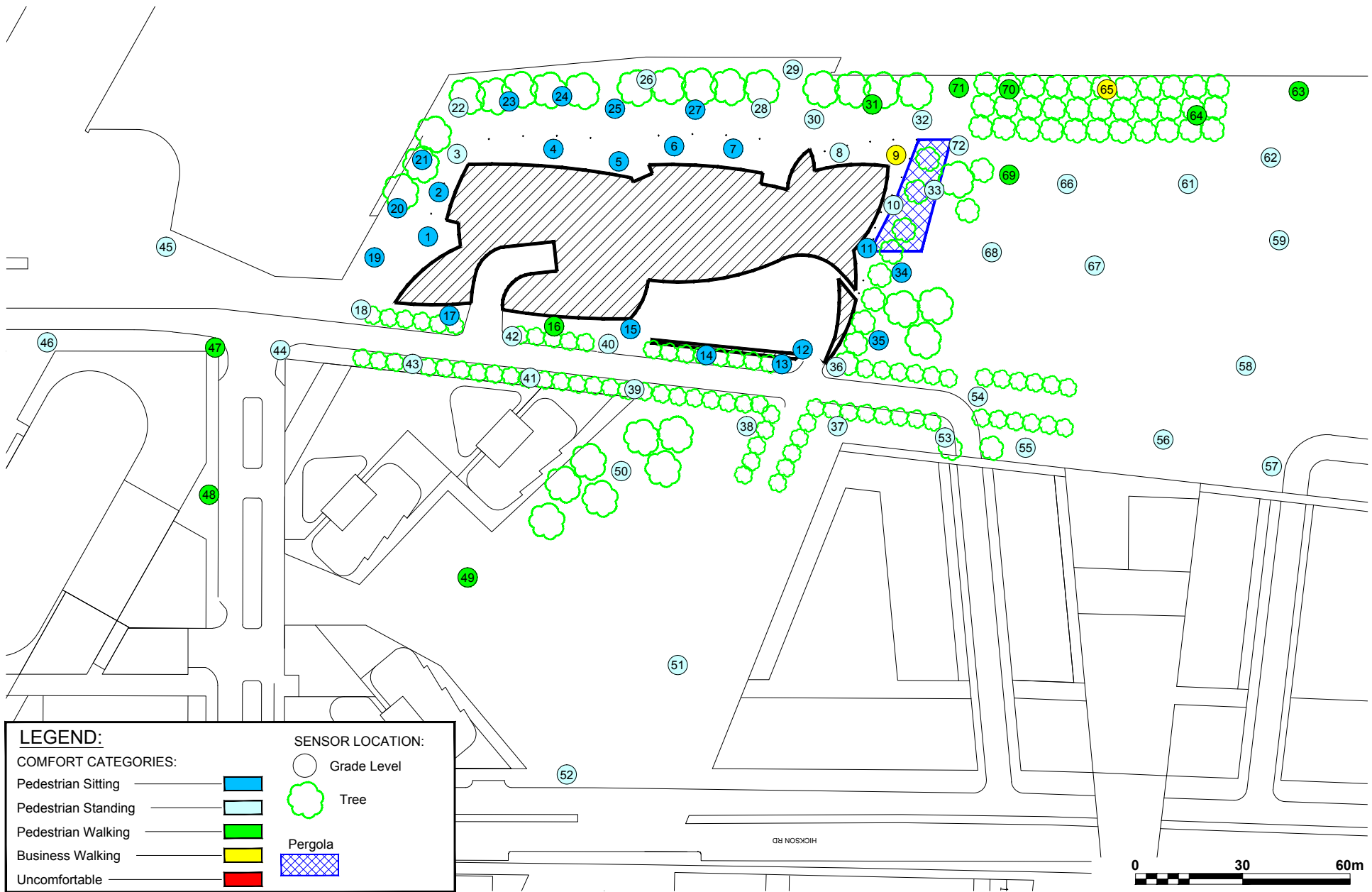
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Drawn by: ARM Figure: 6C
 Approx. Scale: 1:1500
 Date Revised: July 18, 2014



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Pedestrian Wind Comfort Conditions - Revised Landscaping with Pergola
 Spring (September to November, 0:00 to 23:00)
 T.V. Lawson Criteria

Crown Tower - Sydney, Australia



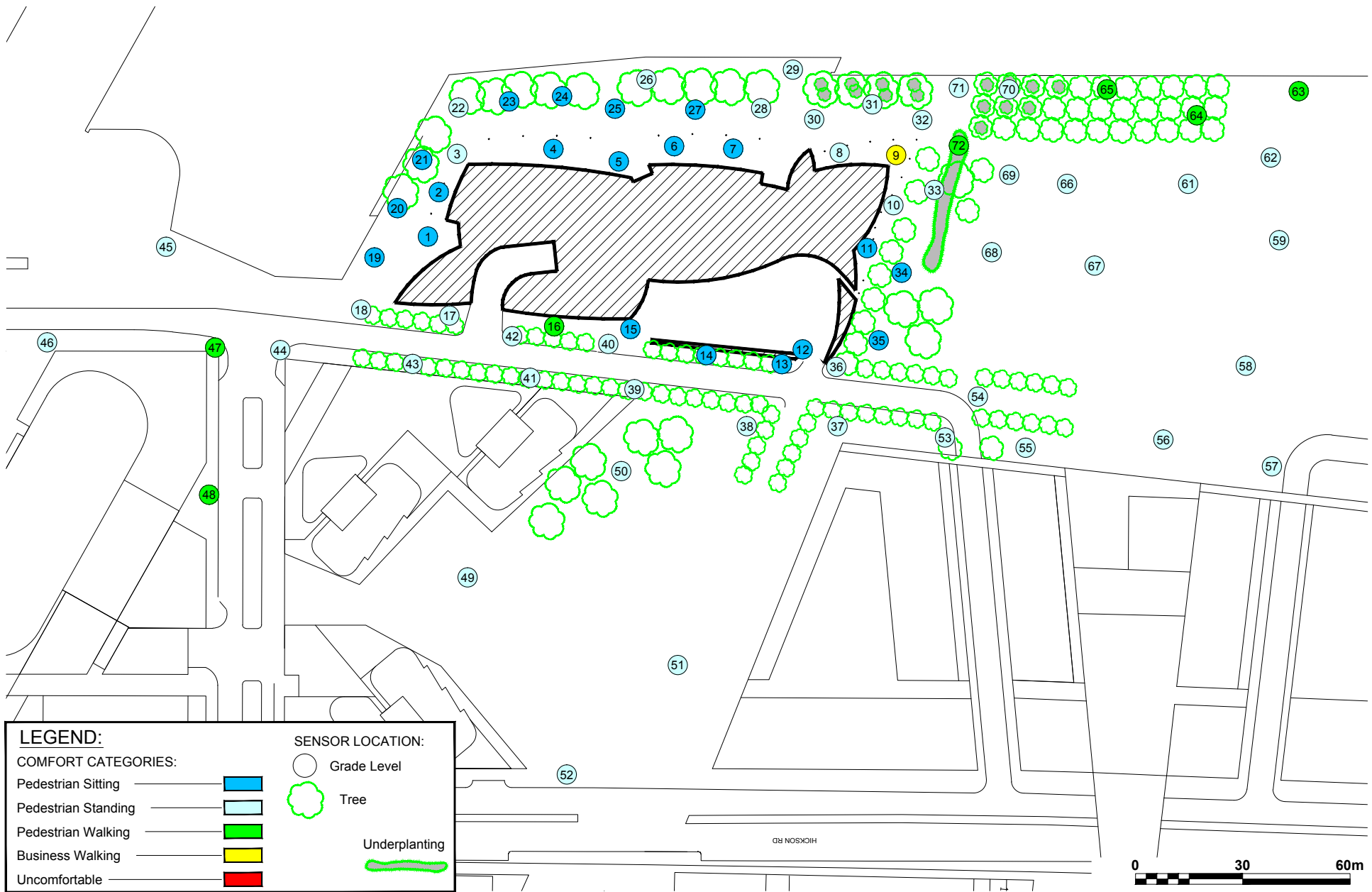
Drawn by: ARM Figure: 6d

Approx. Scale: 1:1500

Date Revised: July 18, 2014

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LEGEND:

COMFORT CATEGORIES:

- Pedestrian Sitting — [Blue Box]
- Pedestrian Standing — [Light Blue Box]
- Pedestrian Walking — [Green Box]
- Business Walking — [Yellow Box]
- Uncomfortable — [Red Box]

SENSOR LOCATION:

- Grade Level
- ☁ Tree
- Underplanting

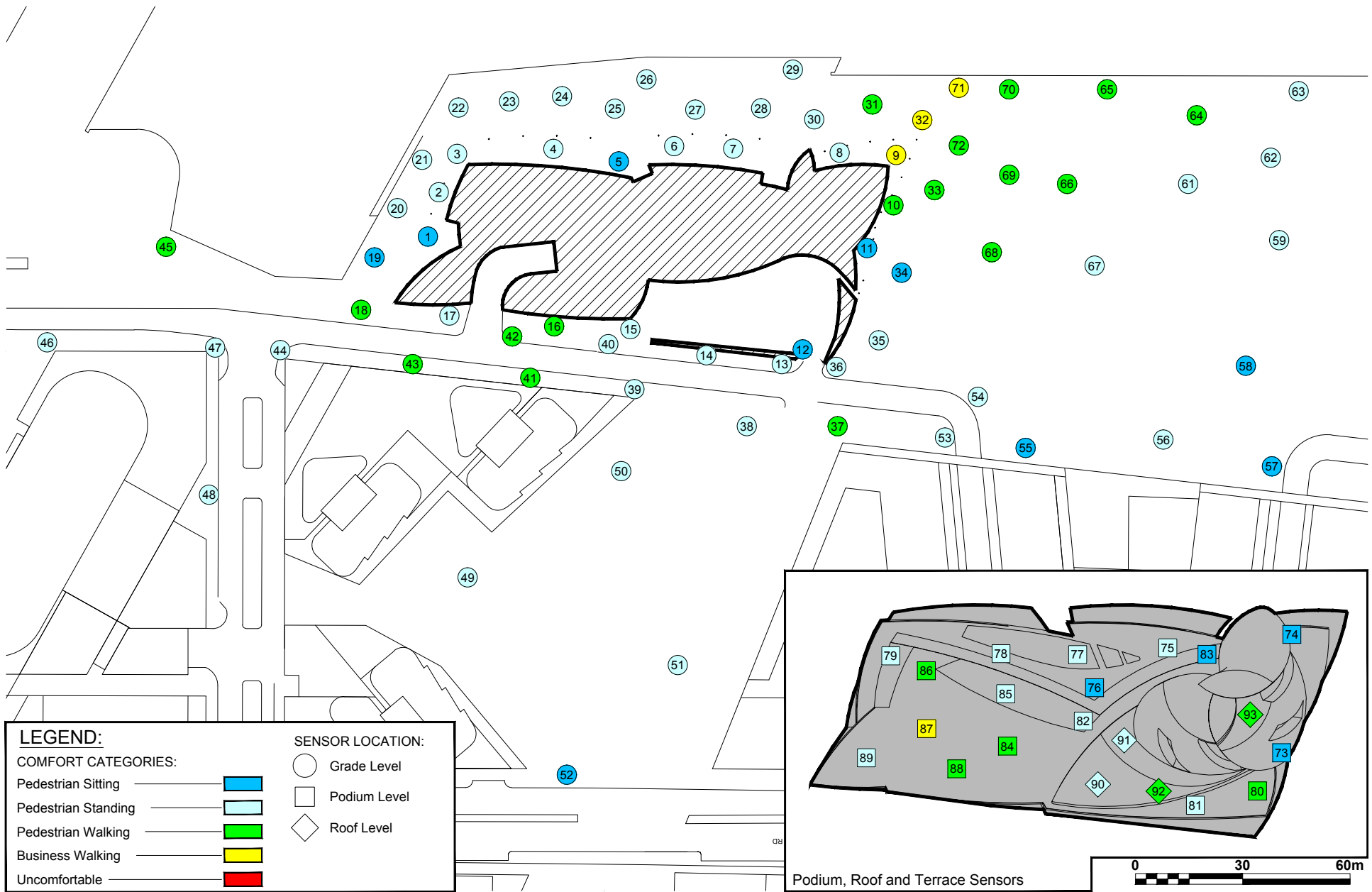
Pedestrian Wind Comfort Conditions - Revised Landscaping Plan with Underplanting
 Spring (September to November, 0:00 to 23:00)
 T.V. Lawson Criteria
 Crown Tower - Sydney, Australia



Drawn by: ARM Figure: 6e
 Approx. Scale: 1:1500
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LEGEND:

COMFORT CATEGORIES:

Pedestrian Sitting	
Pedestrian Standing	
Pedestrian Walking	
Business Walking	
Uncomfortable	

SENSOR LOCATION:

	Grade Level
	Podium Level
	Roof Level

Pedestrian Wind Comfort Conditions - No Landscaping
 Summer (December to February, 0:00 to 23:00)

Crown Tower - Sydney, Australia



Drawn by: MDN Figure: 7a

Approx. Scale: 1:1500

Date Revised: June 24, 2014

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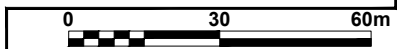
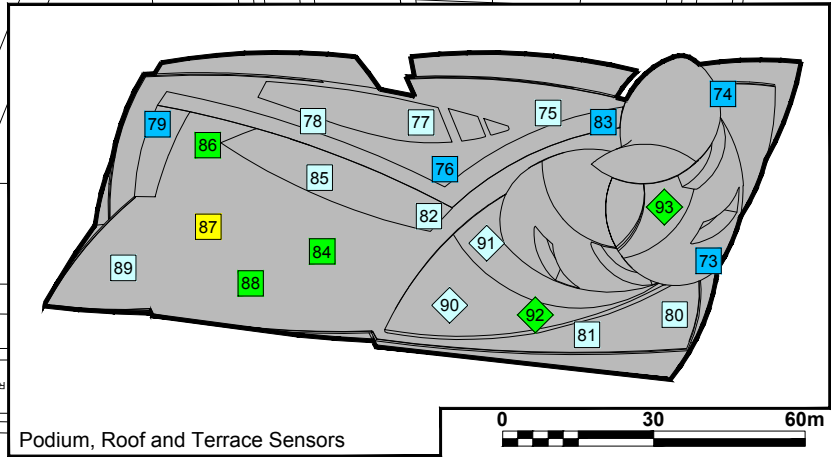
LEGEND:

COMFORT CATEGORIES:

Pedestrian Sitting	
Pedestrian Standing	
Pedestrian Walking	
Business Walking	
Uncomfortable	

SENSOR LOCATION:

	Grade Level
	Podium Level
	Roof Level
	Tree



Pedestrian Wind Comfort Conditions - Landscaping
 Summer (December to February, 0:00 to 23:00)

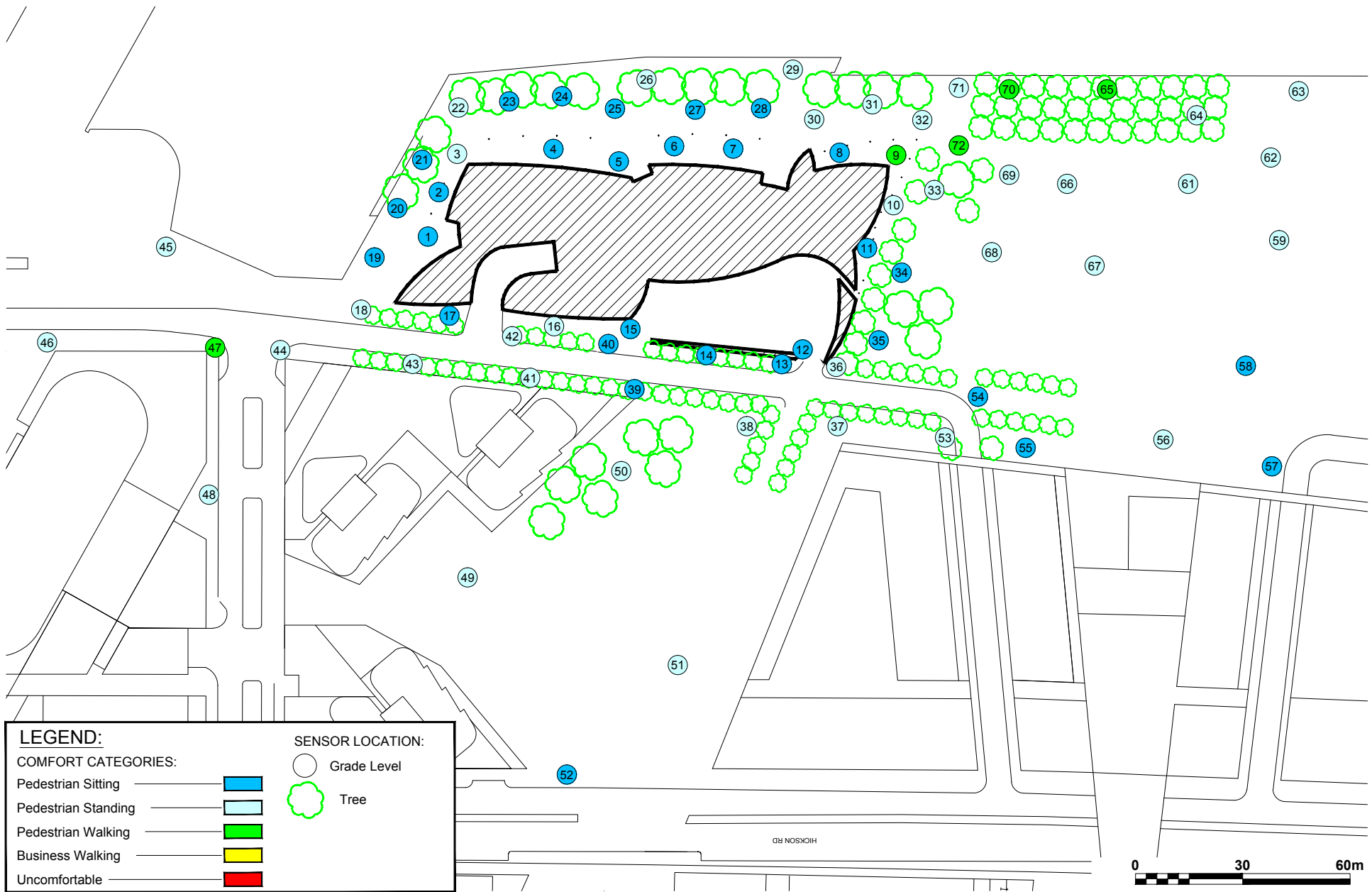
Crown Tower - Sydney, Australia



Drawn by: MDN	Figure: 7b
Approx. Scale: 1:1500	
Date Revised: June 24, 2014	

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LEGEND:

COMFORT CATEGORIES:

Pedestrian Sitting	
Pedestrian Standing	
Pedestrian Walking	
Business Walking	
Uncomfortable	

SENSOR LOCATION:

	Grade Level
	Tree

Pedestrian Wind Comfort Conditions - Revised Landscaping Plan
 Summer (December to February, 0:00 to 23:00)
 T.V. Lawson Criteria

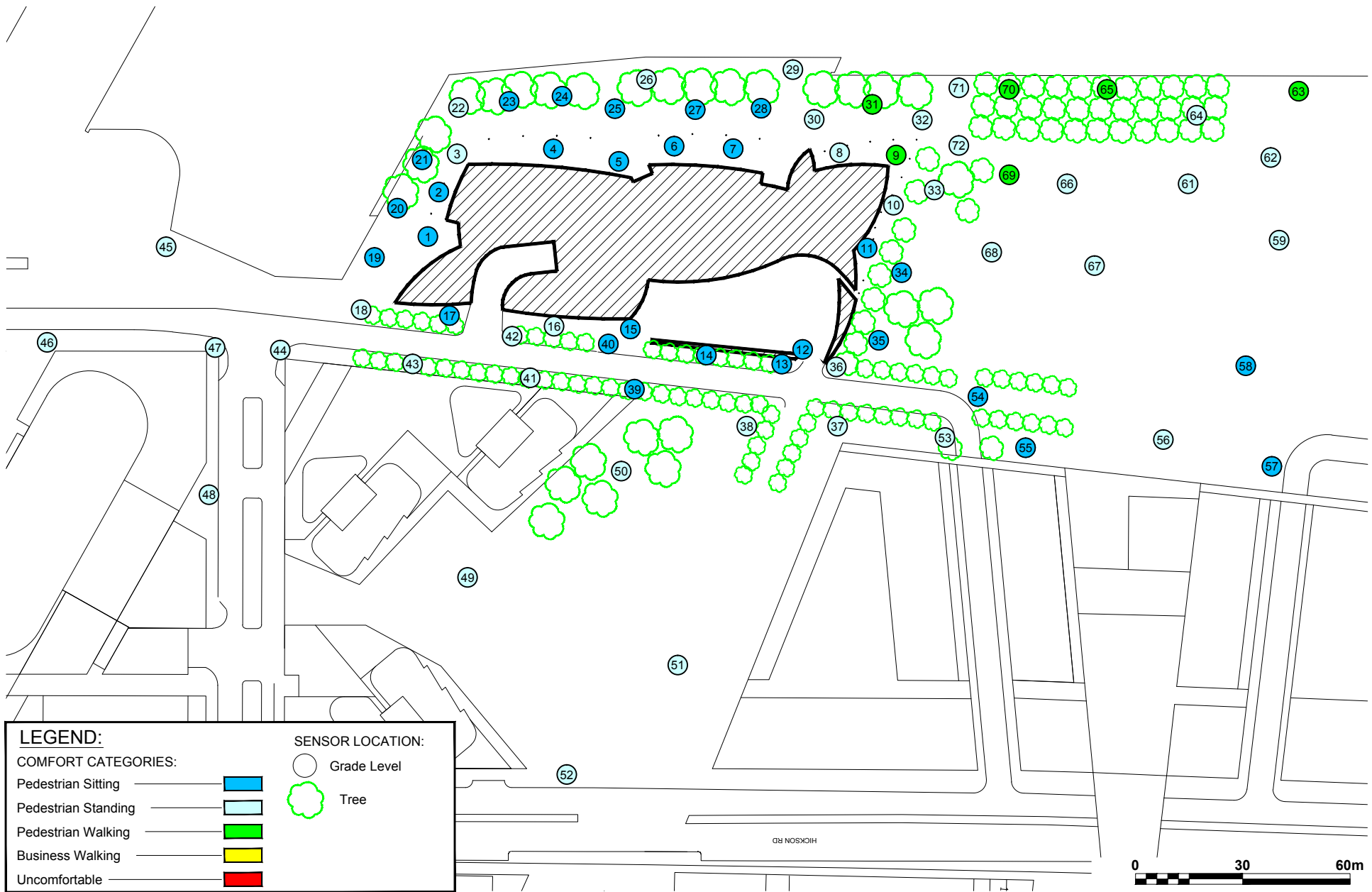
Crown Tower - Sydney, Australia



Drawn by: ARM	Figure: 7C
Approx. Scale: 1:1500	
Date Revised: July 18, 2014	



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Pedestrian Wind Comfort Conditions - Revised Landscaping with Pergola
 Summer (December to February, 0:00 to 23:00)
 T.V. Lawson Criteria

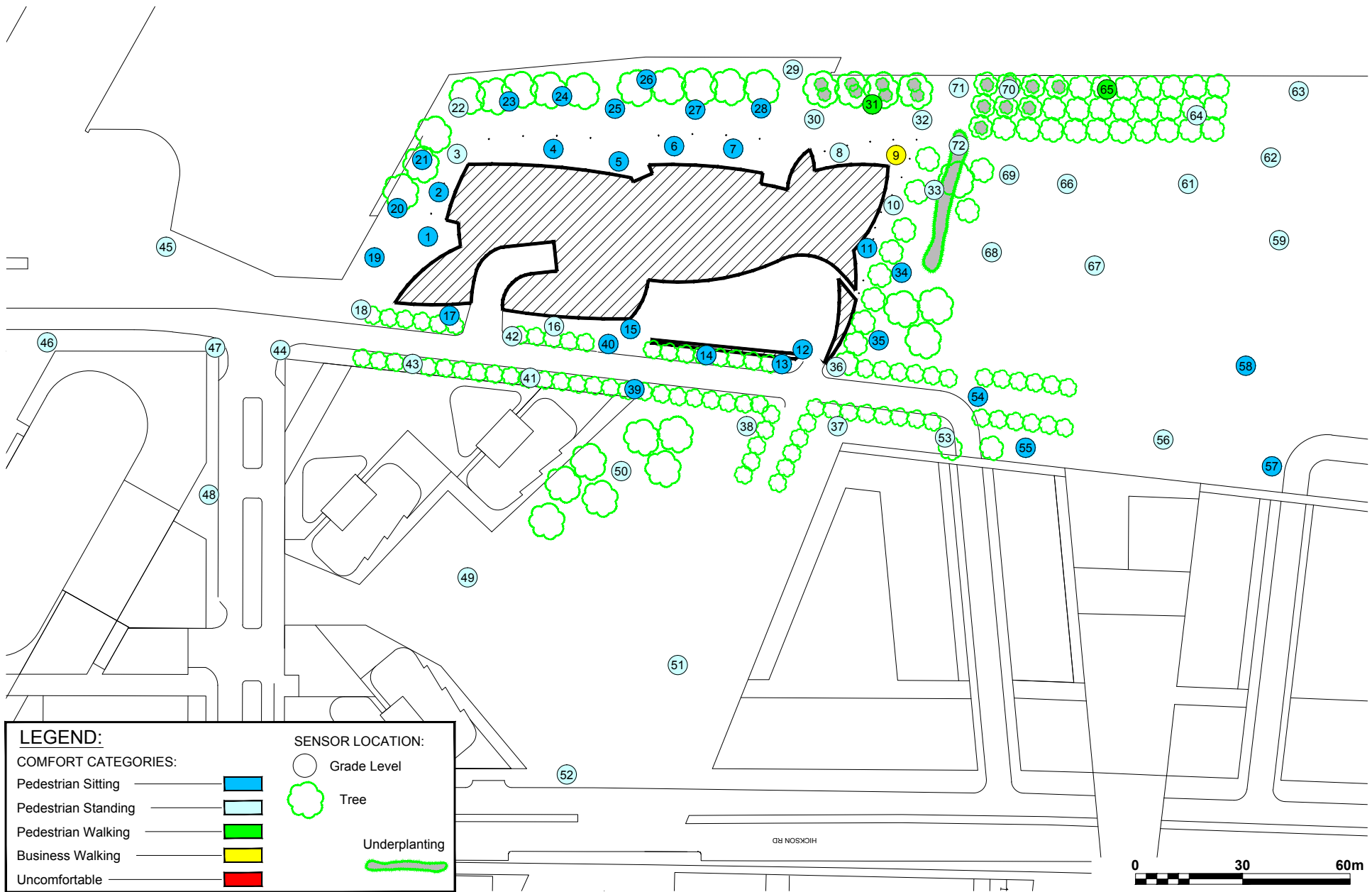
Crown Tower - Sydney, Australia



Drawn by: ARM	Figure: 7d
Approx. Scale: 1:1500	
Date Revised: July 18, 2014	

Project #1401805





LEGEND:

COMFORT CATEGORIES:

- Pedestrian Sitting — [Blue Box]
- Pedestrian Standing — [Light Blue Box]
- Pedestrian Walking — [Green Box]
- Business Walking — [Yellow Box]
- Uncomfortable — [Red Box]

SENSOR LOCATION:

- Grade Level
- ☁ Tree
- Underplanting

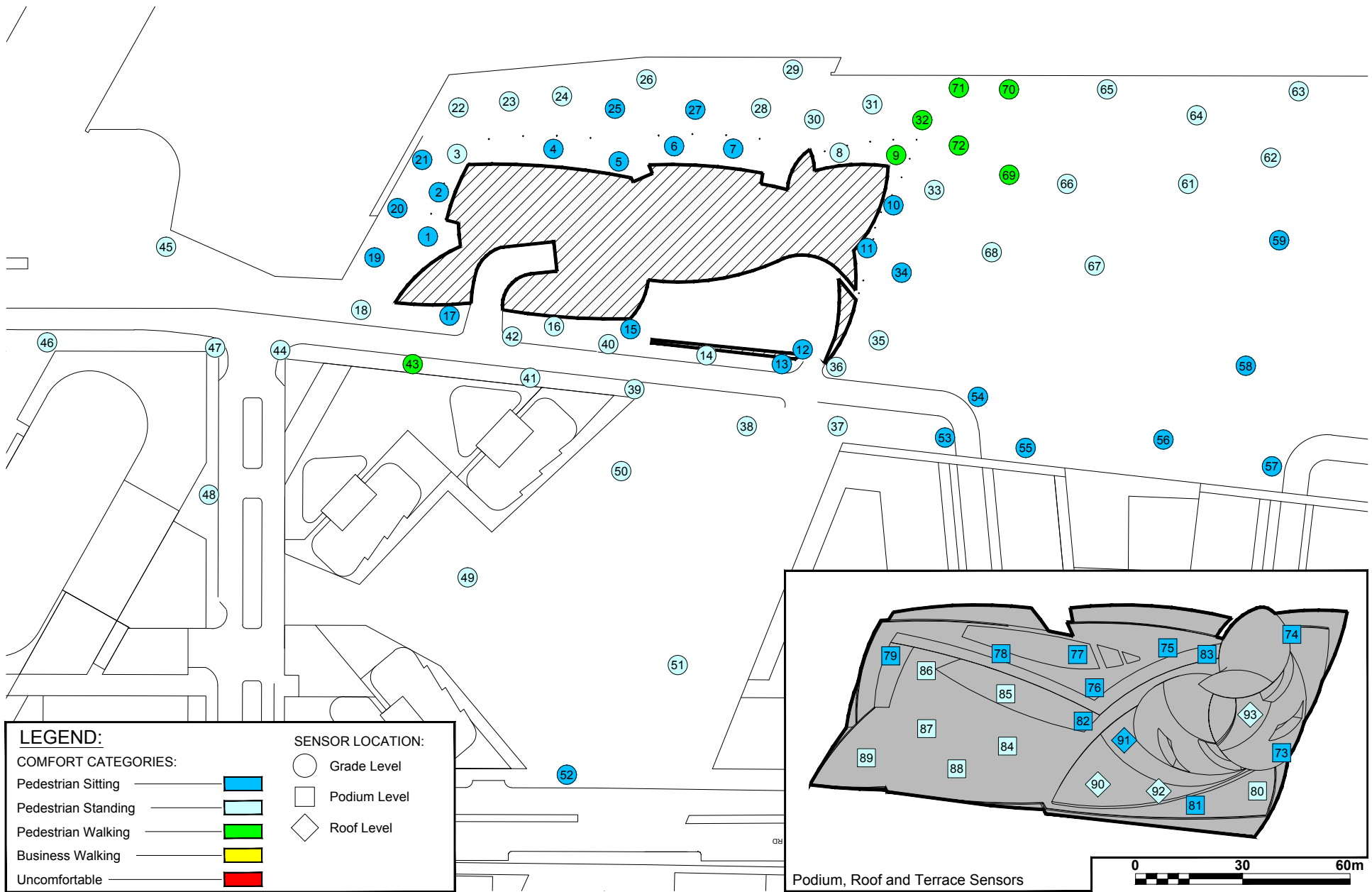
Pedestrian Wind Comfort Conditions - Revised Landscaping Plan with Underplanting
 Summer (December to February, 0:00 to 23:00)
 T.V. Lawson Criteria
 Crown Tower - Sydney, Australia



Drawn by: ARM Figure: 7e
 Approx. Scale: 1:1500
 Date Revised: July 18, 2014



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Pedestrian Wind Comfort Conditions - No Landscaping
 Autumn (March to May, 0:00 to 23:00)

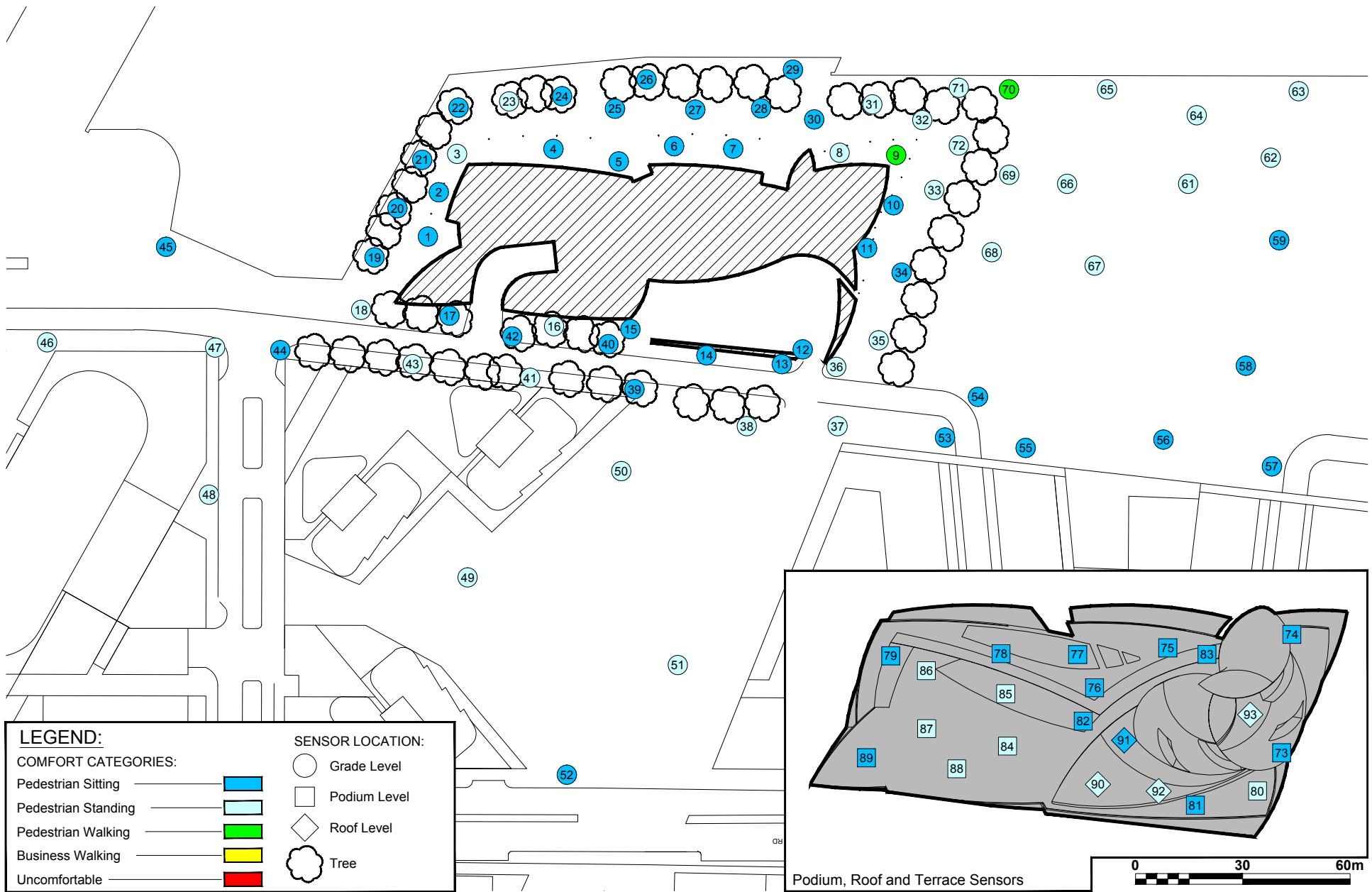
Crown Tower - Sydney, Australia



Drawn by: MDN	Figure: 8a
Approx. Scale: 1:1500	
Date Revised: June 24, 2014	

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Pedestrian Wind Comfort Conditions - Landscaping
 Autumn (March to May, 0:00 to 23:00)

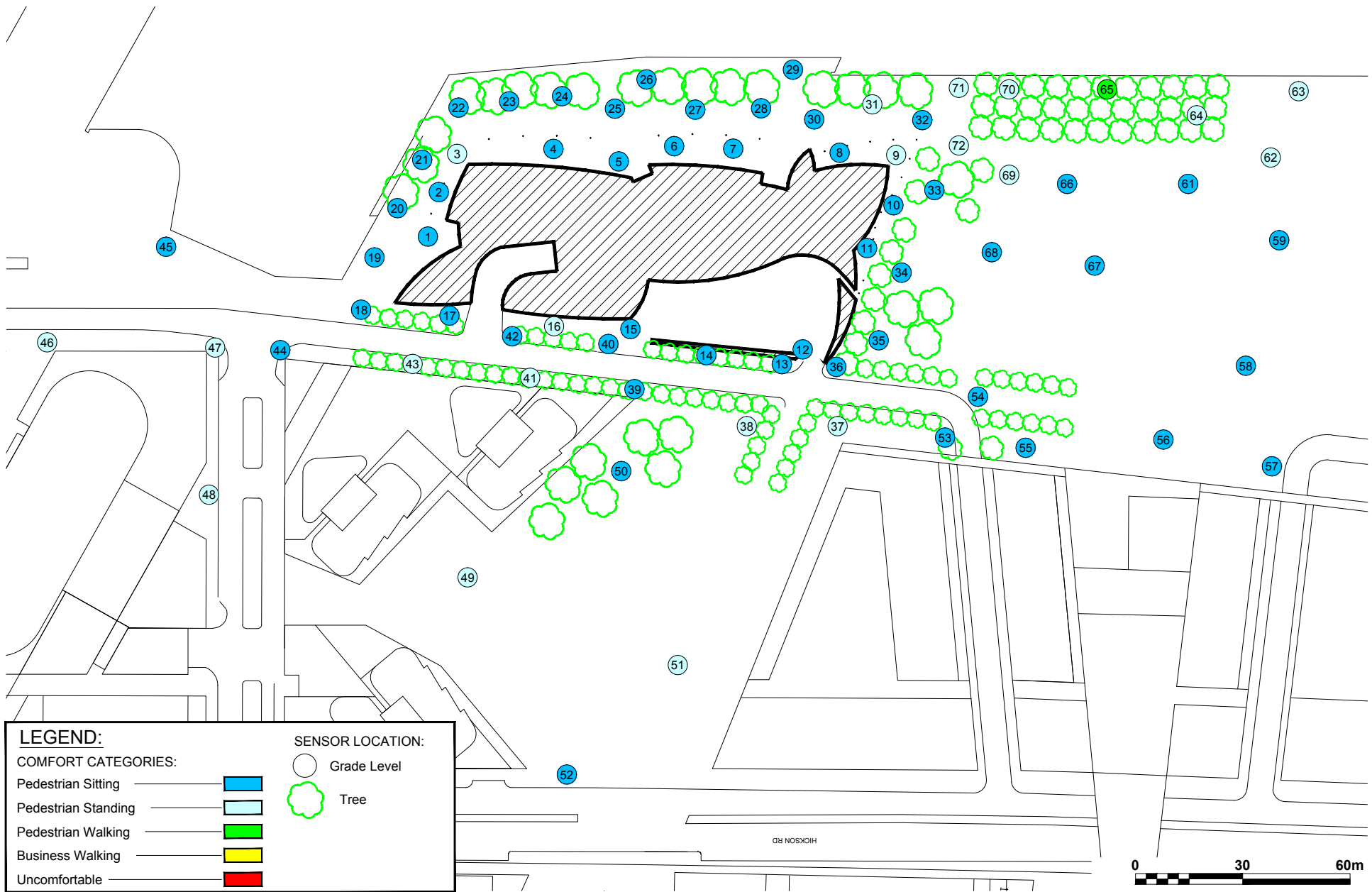
Crown Tower - Sydney, Australia



Drawn by: MDN	Figure: 8b
Approx. Scale: 1:1500	
Date Revised: June 24, 2014	

Project #1401805





LEGEND:

COMFORT CATEGORIES:

Pedestrian Sitting	
Pedestrian Standing	
Pedestrian Walking	
Business Walking	
Uncomfortable	

SENSOR LOCATION:

	Grade Level
	Tree

Pedestrian Wind Comfort Conditions - Revised Landscaping Plan
 Autumn (March to May, 0:00 to 23:00)
 T.V. Lawson Criteria

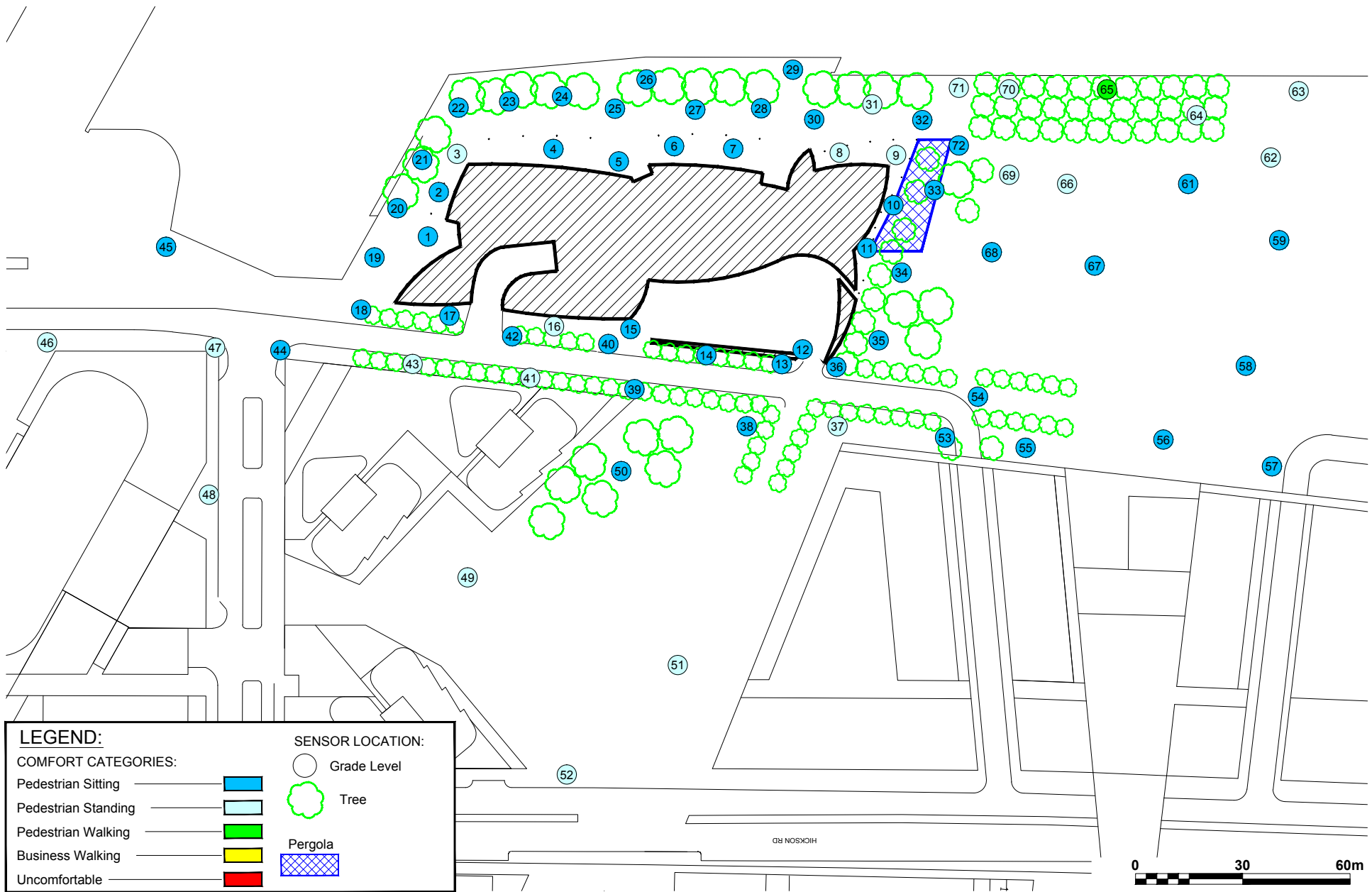
Crown Tower - Sydney, Australia



Drawn by: ARM	Figure: 8C
Approx. Scale: 1:1500	
Date Revised: July 18, 2014	



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LEGEND:

COMFORT CATEGORIES:

- Pedestrian Sitting — [Blue Box]
- Pedestrian Standing — [Light Blue Box]
- Pedestrian Walking — [Green Box]
- Business Walking — [Yellow Box]
- Uncomfortable — [Red Box]

SENSOR LOCATION:

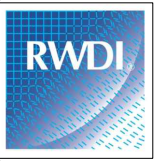
- Grade Level
- Tree
- ▨ Pergola

Pedestrian Wind Comfort Conditions - Revised Landscaping with Pergola
 Autumn (March to May, 0:00 to 23:00)
 T.V. Lawson Criteria

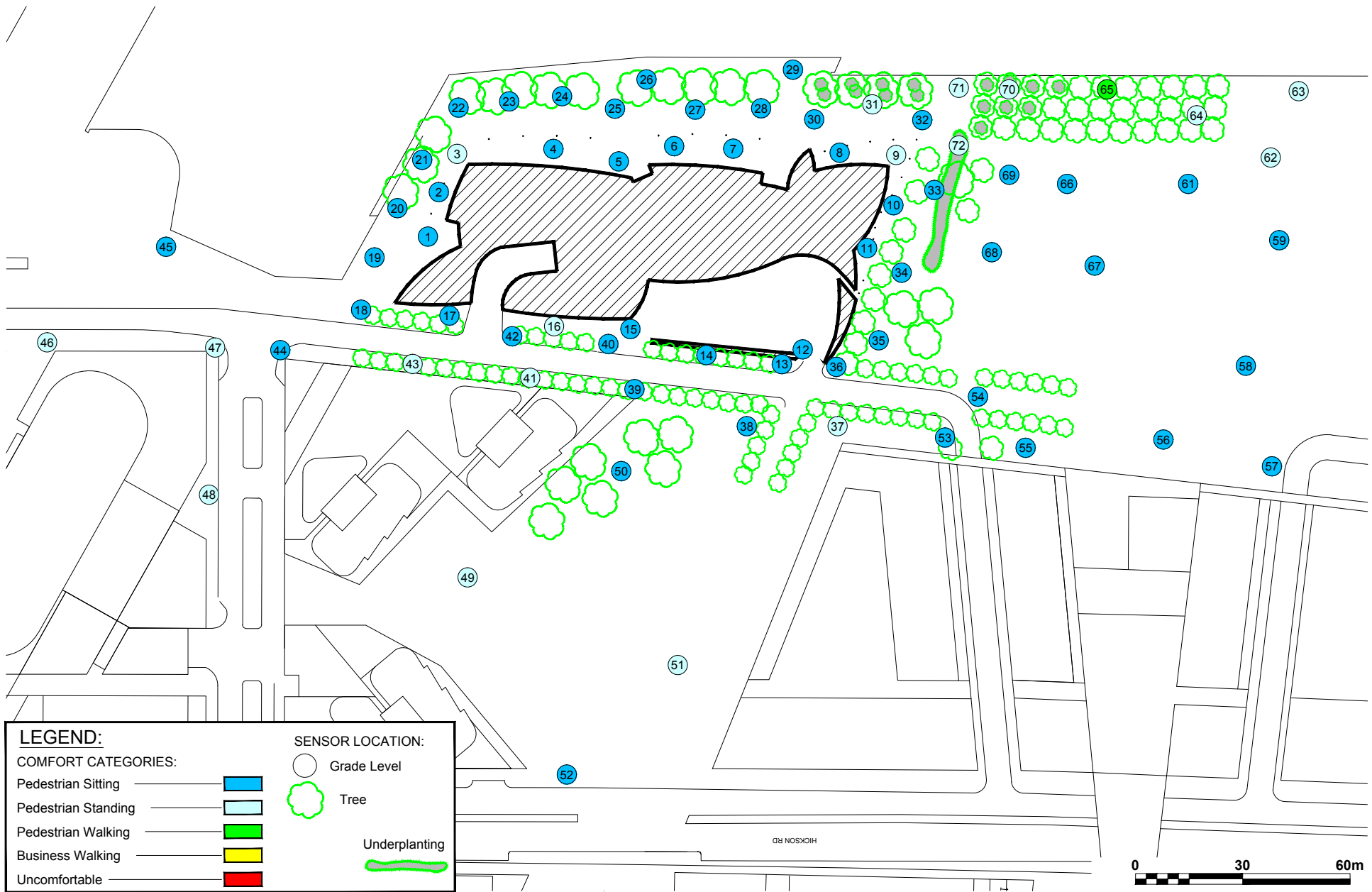
Crown Tower - Sydney, Australia



Drawn by: ARM Figure: 8d
 Approx. Scale: 1:1500
 Date Revised: July 18, 2014



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LEGEND:

COMFORT CATEGORIES:

Pedestrian Sitting	
Pedestrian Standing	
Pedestrian Walking	
Business Walking	
Uncomfortable	

SENSOR LOCATION:

	Grade Level
	Tree
	Underplanting

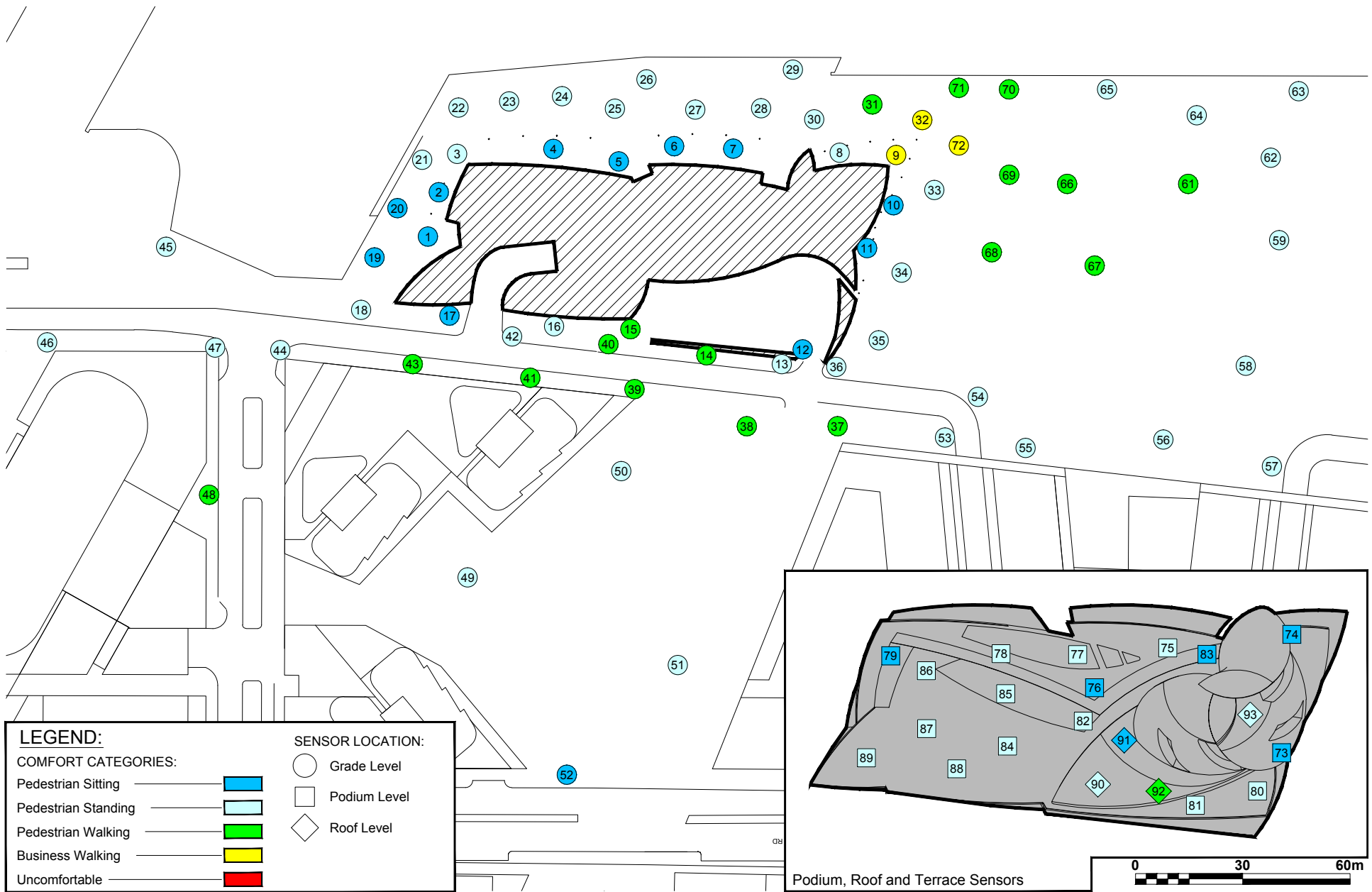
Pedestrian Wind Comfort Conditions - Revised Landscaping Plan with Underplanting
 Autumn (March to May, 0:00 to 23:00)
 T.V. Lawson Criteria
 Crown Tower - Sydney, Australia



Drawn by: ARM Figure: 8e
 Approx. Scale: 1:1500
 Date Revised: July 18, 2014



Project #1401805



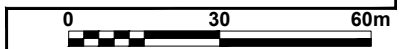
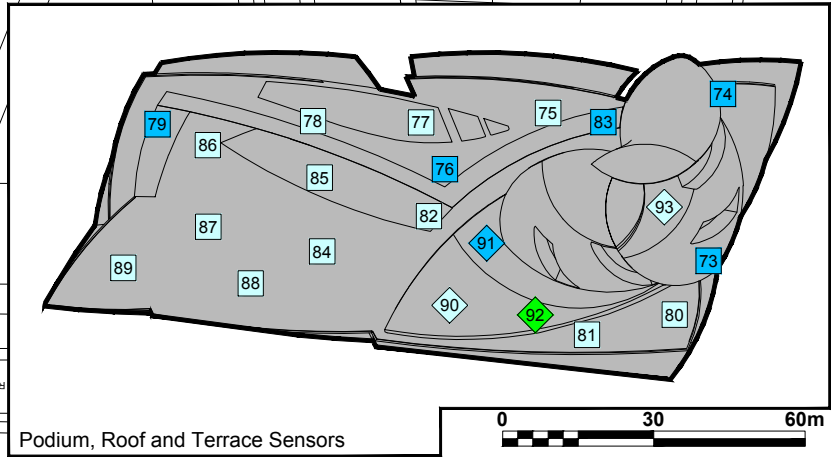
LEGEND:

COMFORT CATEGORIES:

Pedestrian Sitting	
Pedestrian Standing	
Pedestrian Walking	
Business Walking	
Uncomfortable	

SENSOR LOCATION:

	Grade Level
	Podium Level
	Roof Level



Pedestrian Wind Comfort Conditions - No Landscaping
 Winter (June to August, 0:00 to 23:00)

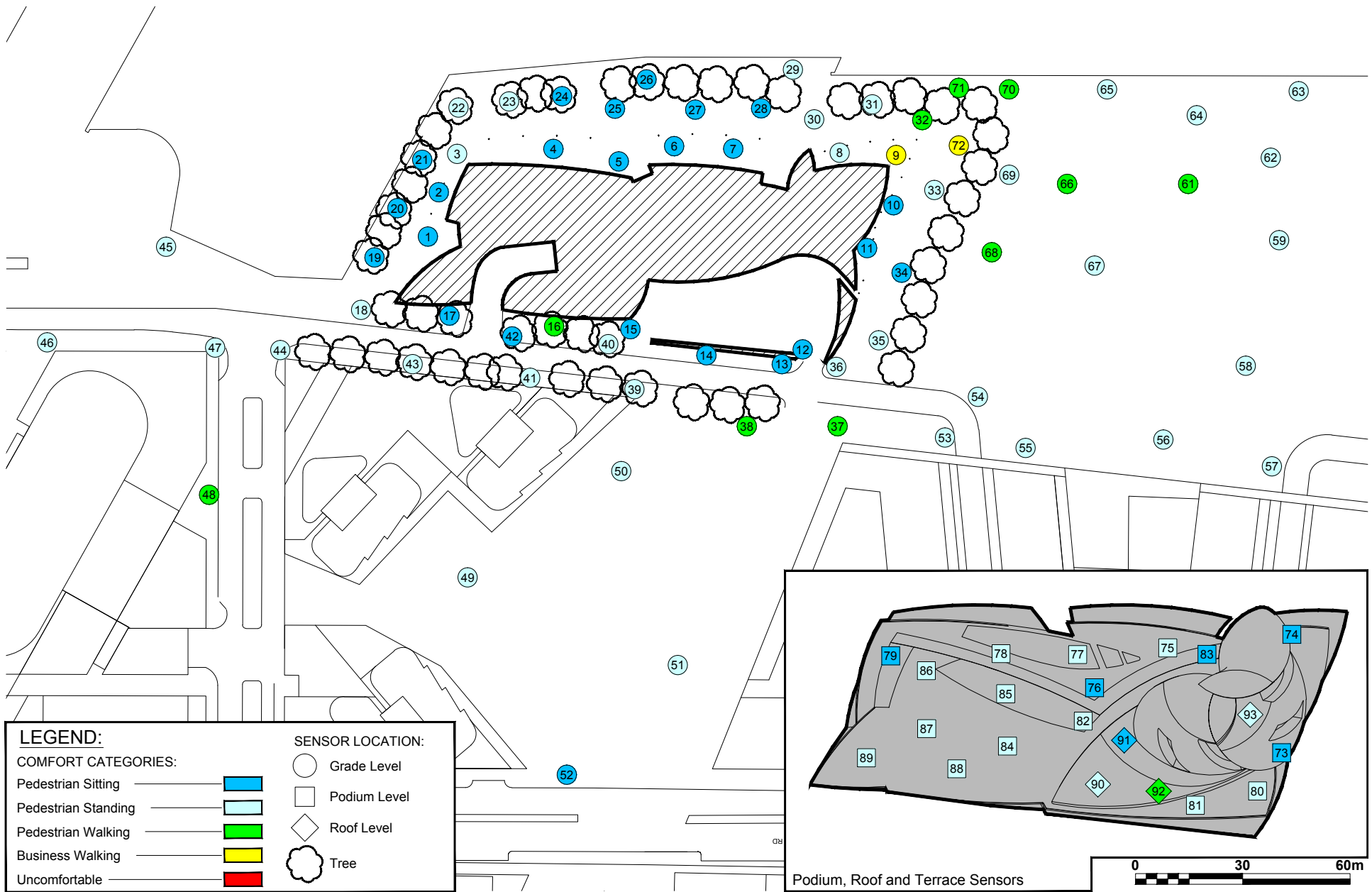
Crown Tower - Sydney, Australia



Drawn by: MDN	Figure: 9a
Approx. Scale: 1:1500	
Date Revised: June 24, 2014	

Project #1401805





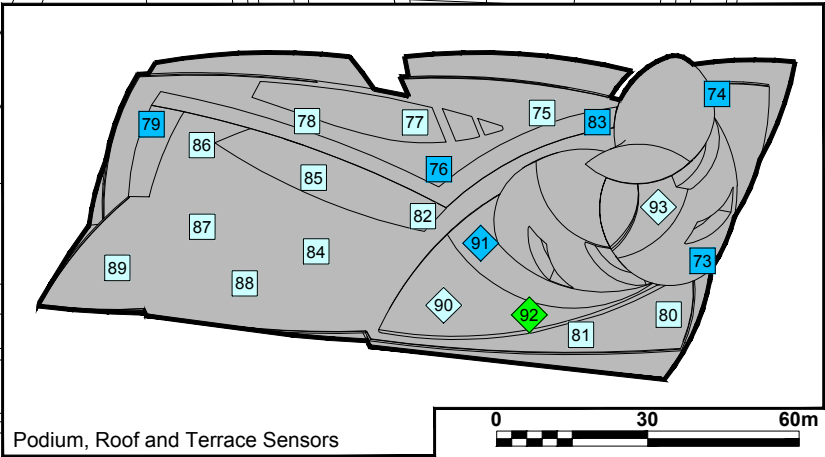
LEGEND:

COMFORT CATEGORIES:

- Pedestrian Sitting
- Pedestrian Standing
- Pedestrian Walking
- Business Walking
- Uncomfortable

SENSOR LOCATION:

- Grade Level
- Podium Level
- Roof Level
- Tree



Pedestrian Wind Comfort Conditions - Landscaping
 Winter (June to August, 0:00 to 23:00)

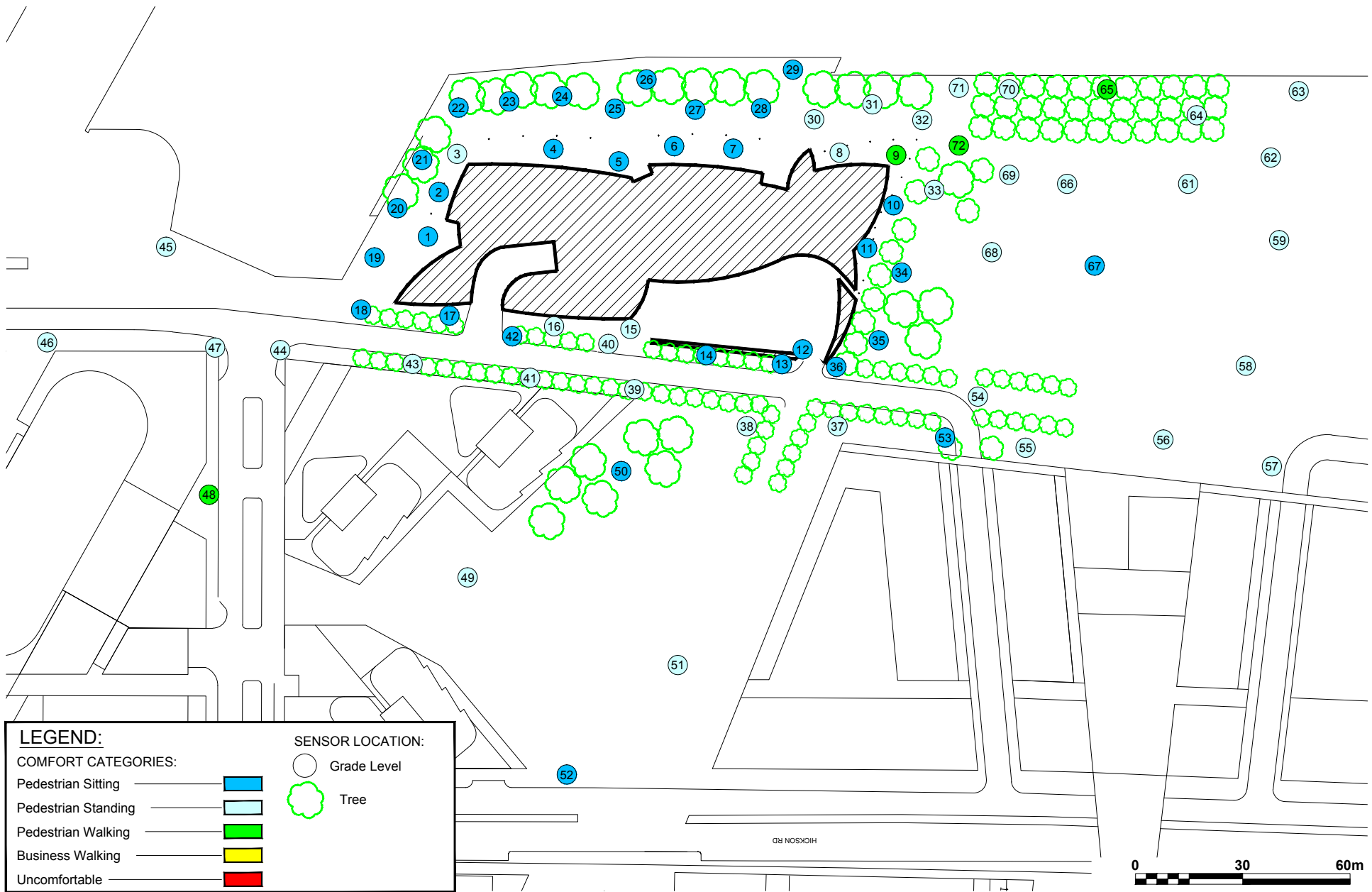
Crown Tower - Sydney, Australia



Drawn by: MDN	Figure: 9b
Approx. Scale: 1:1500	
Date Revised: June 24, 2014	

Project #1401805





LEGEND:

COMFORT CATEGORIES:

Pedestrian Sitting	
Pedestrian Standing	
Pedestrian Walking	
Business Walking	
Uncomfortable	

SENSOR LOCATION:

	Grade Level
	Tree

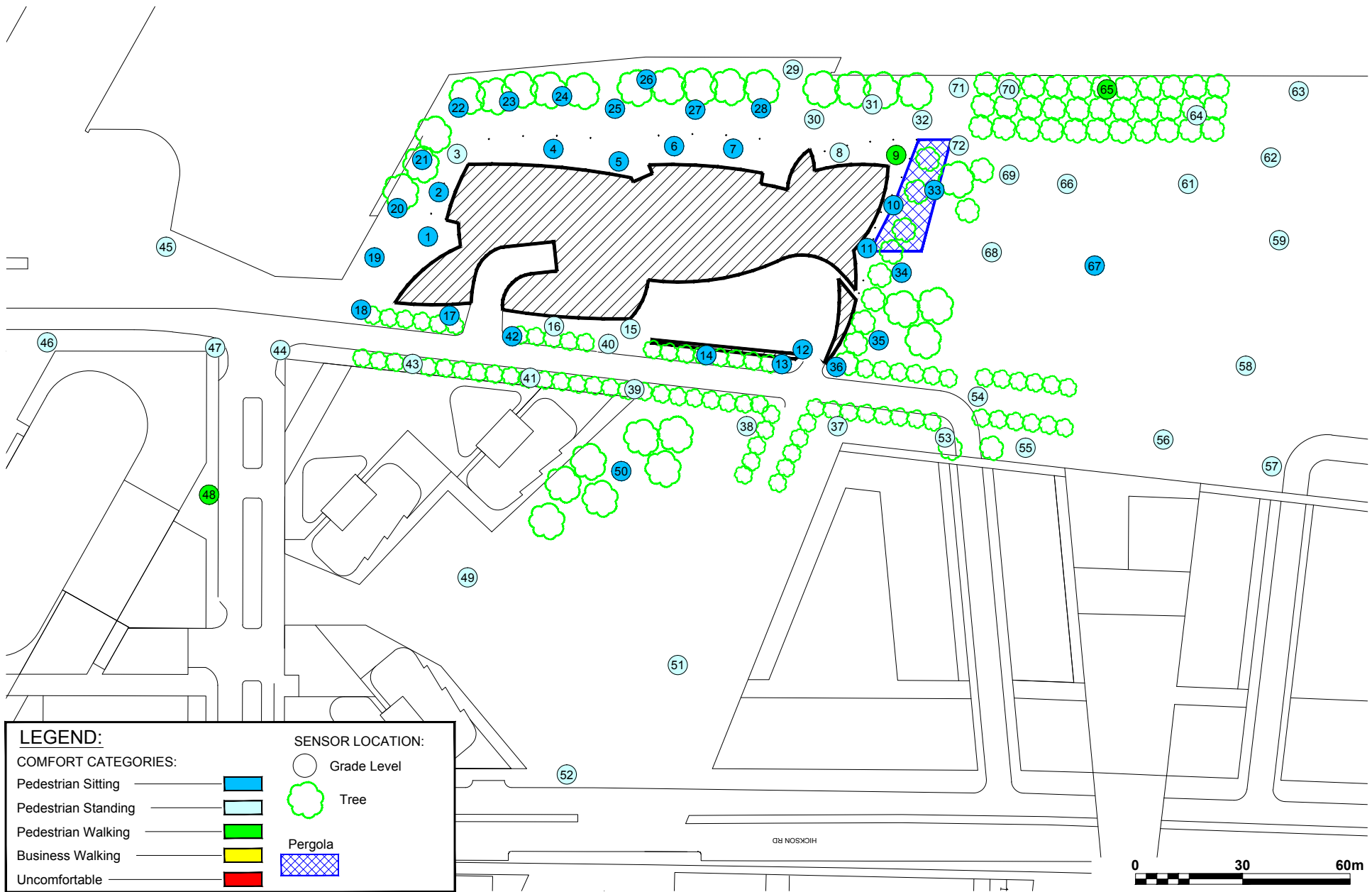
Pedestrian Wind Comfort Conditions - Revised Landscaping Plan
 Winter (June to August, 0:00 to 23:00)
 T.V. Lawson Criteria
 Crown Tower - Sydney, Australia



Drawn by: ARM	Figure: 9C
Approx. Scale: 1:1500	
Date Revised: July 18, 2014	

Project #1401805





LEGEND:

COMFORT CATEGORIES:

- Pedestrian Sitting — [Blue Box]
- Pedestrian Standing — [Light Blue Box]
- Pedestrian Walking — [Green Box]
- Business Walking — [Yellow Box]
- Uncomfortable — [Red Box]

SENSOR LOCATION:

- [White Circle] Grade Level
- [Green Circle] Tree
- [Blue Cross-hatched Box] Pergola

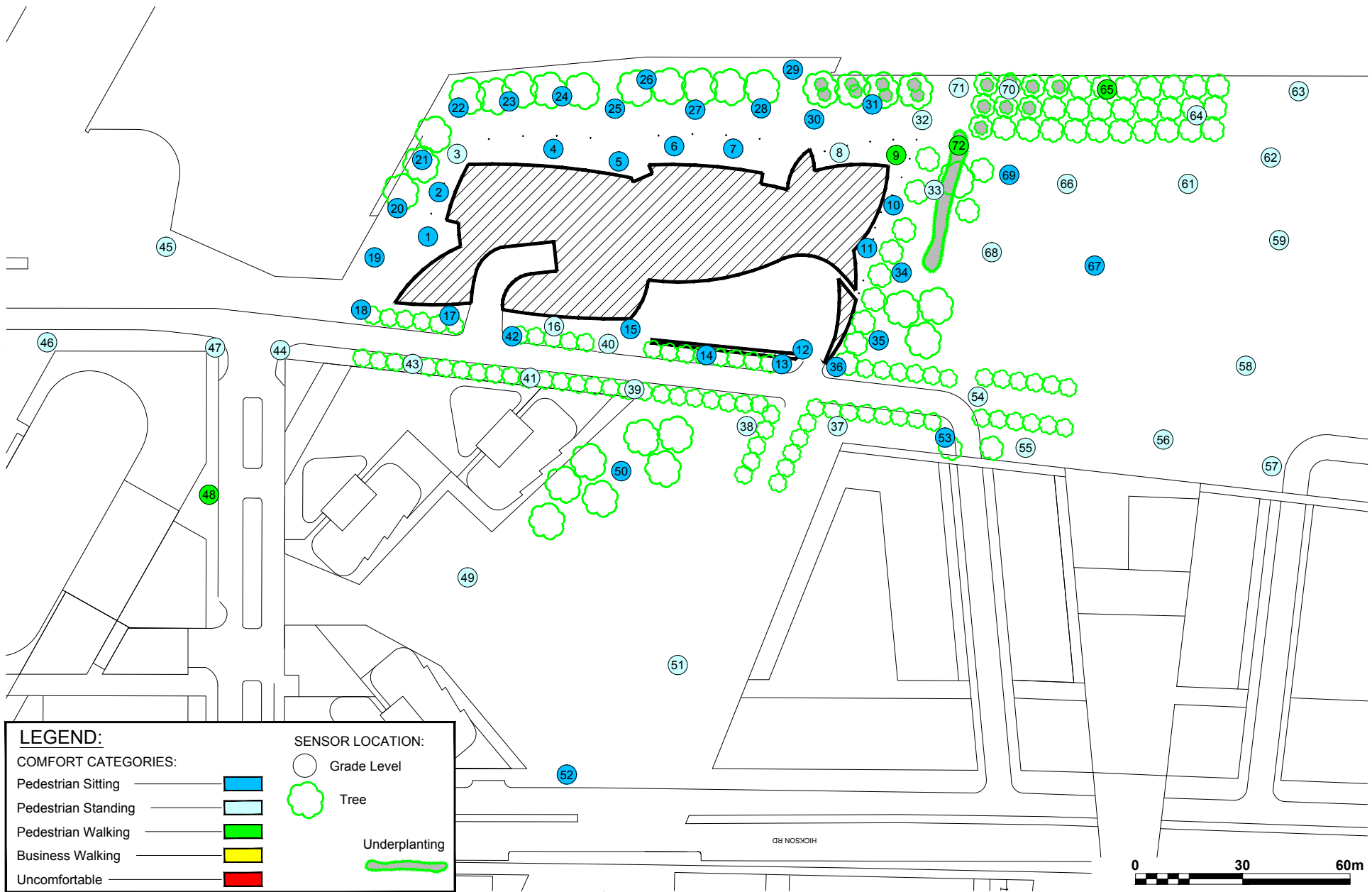
Pedestrian Wind Comfort Conditions - Revised Landscaping with Pergola
 Winter (June to August, 0:00 to 23:00)
 T.V. Lawson Criteria
 Crown Tower - Sydney, Australia



Drawn by: ARM Figure: 9d
 Approx. Scale: 1:1500
 Date Revised: July 18, 2014



Project #1401805



LEGEND:

COMFORT CATEGORIES:

- Pedestrian Sitting —
- Pedestrian Standing —
- Pedestrian Walking —
- Business Walking —
- Uncomfortable —

SENSOR LOCATION:

- Grade Level
- Tree
- Underplanting

Pedestrian Wind Comfort Conditions - Revised Landscaping Plan with Underplanting
 Winter (June to August, 0:00 to 23:00)
 T.V. Lawson Criteria

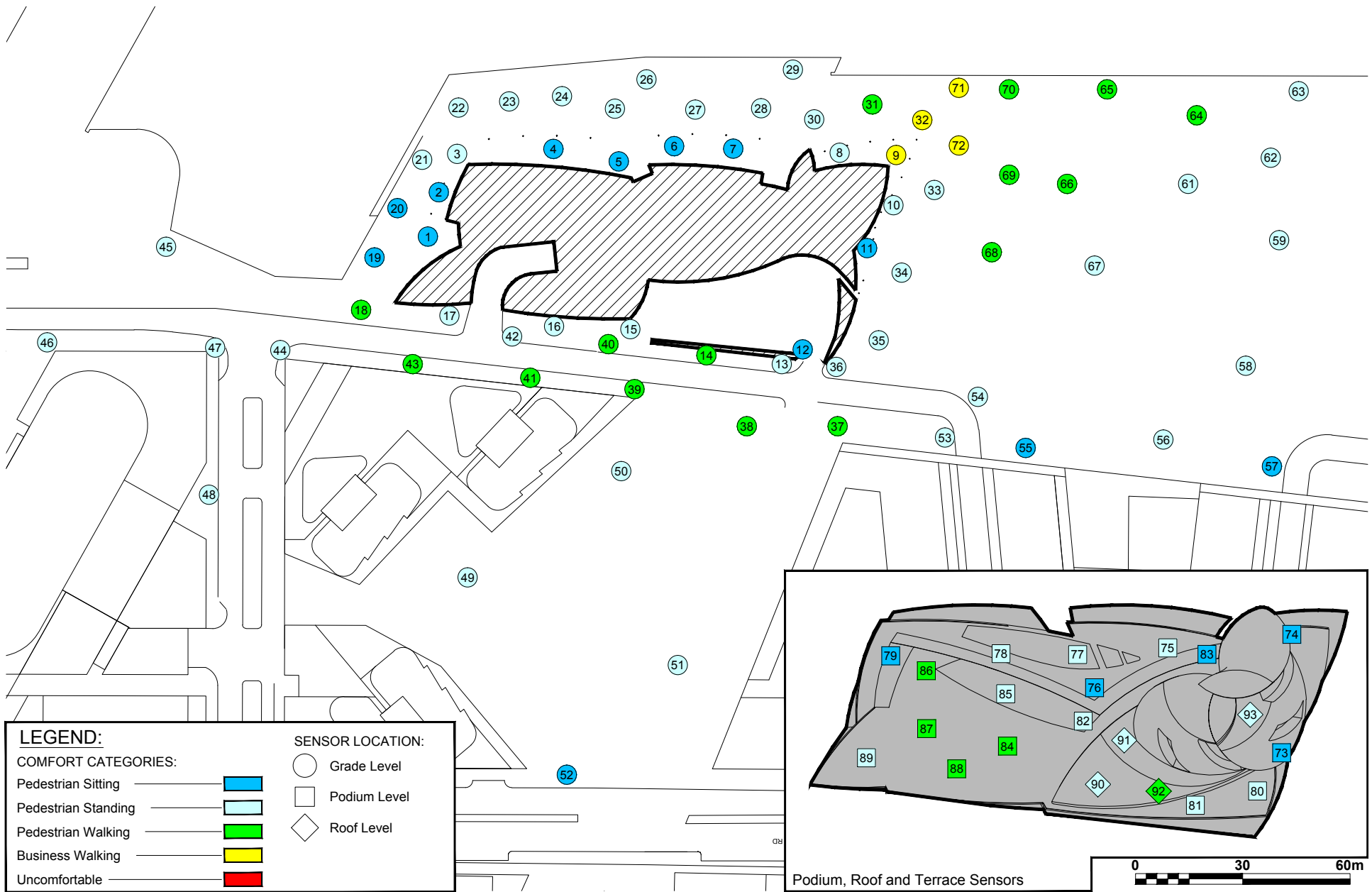
Crown Tower - Sydney, Australia



Drawn by: ARM	Figure: 9e
Approx. Scale: 1:1500	
Date Revised: July 18, 2014	

Project #1401805





Pedestrian Wind Comfort Conditions - No Landscaping
 Annual (January to December, 0:00 to 23:00)

Crown Tower - Sydney, Australia



Drawn by: MDN Figure: 10a

Approx. Scale: 1:1500

Date Revised: June 24, 2014

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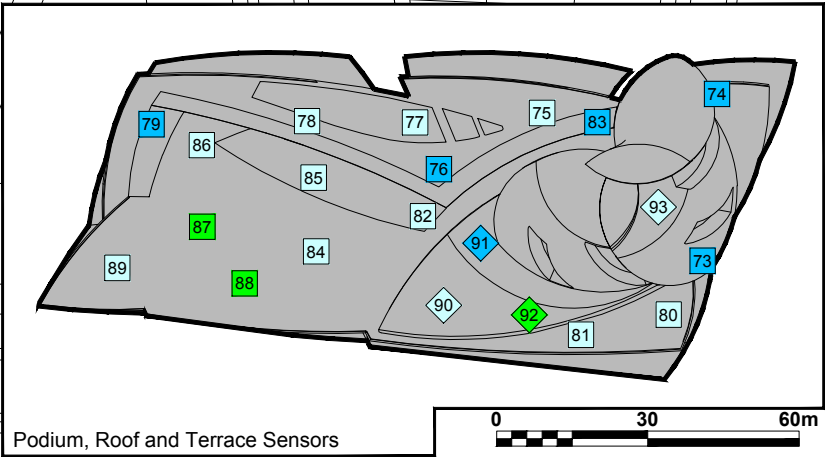
LEGEND:

COMFORT CATEGORIES:

- Pedestrian Sitting
- Pedestrian Standing
- Pedestrian Walking
- Business Walking
- Uncomfortable

SENSOR LOCATION:

- Grade Level
- Podium Level
- Roof Level
- Tree



Pedestrian Wind Comfort Conditions - Landscaping
Annual (January to December, 0:00 to 23:00)

Crown Tower - Sydney, Australia



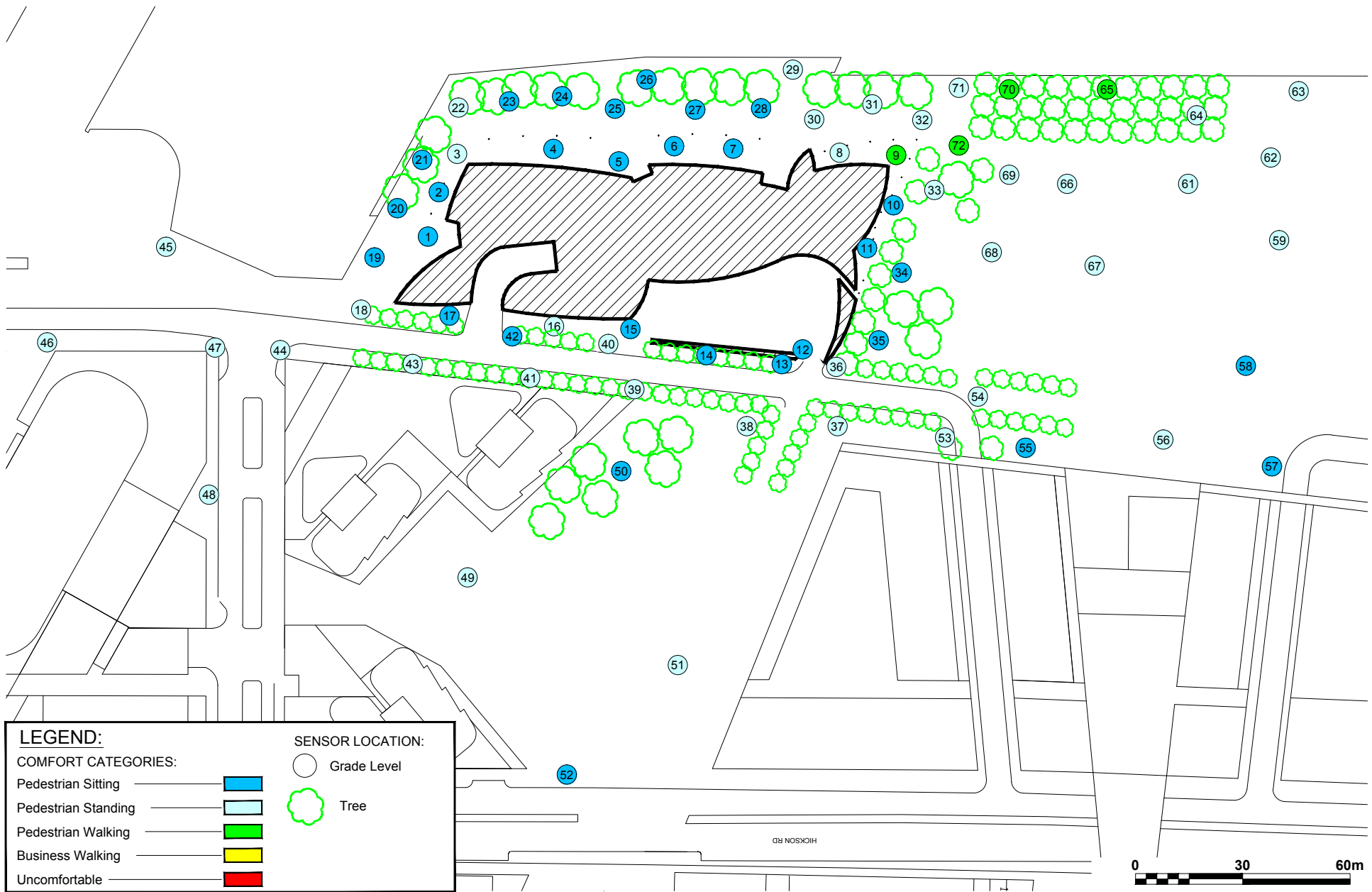
Drawn by: MDN Figure: 10b

Approx. Scale: 1:1500

Date Revised: June 24, 2014

Project #1401805





LEGEND:

COMFORT CATEGORIES:

Pedestrian Sitting	
Pedestrian Standing	
Pedestrian Walking	
Business Walking	
Uncomfortable	

SENSOR LOCATION:

	Grade Level
	Tree

Pedestrian Wind Comfort Conditions - Revised Landscaping Plan
 Annual (January to December, 0:00 to 23:00)

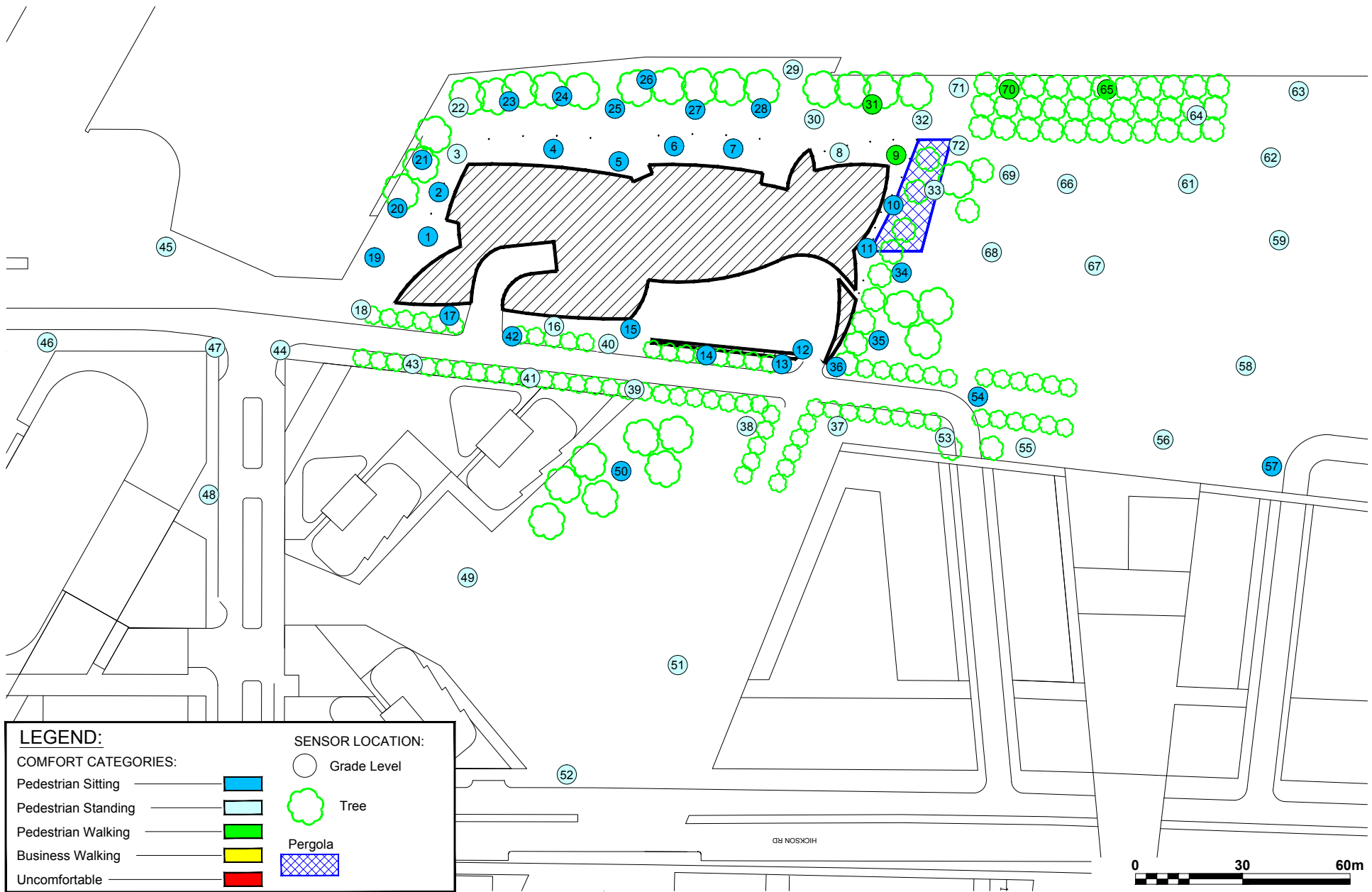
Crown Tower - Sydney, Australia



Drawn by: ARM	Figure: 10c
Approx. Scale: 1:1500	
Date Revised: July 18, 2014	

Project #1401805





LEGEND:

COMFORT CATEGORIES:

- Pedestrian Sitting — [Blue Box]
- Pedestrian Standing — [Light Blue Box]
- Pedestrian Walking — [Green Box]
- Business Walking — [Yellow Box]
- Uncomfortable — [Red Box]

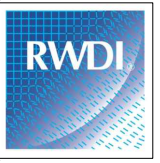
SENSOR LOCATION:

- Grade Level
- ☁ Tree
- ▨ Pergola

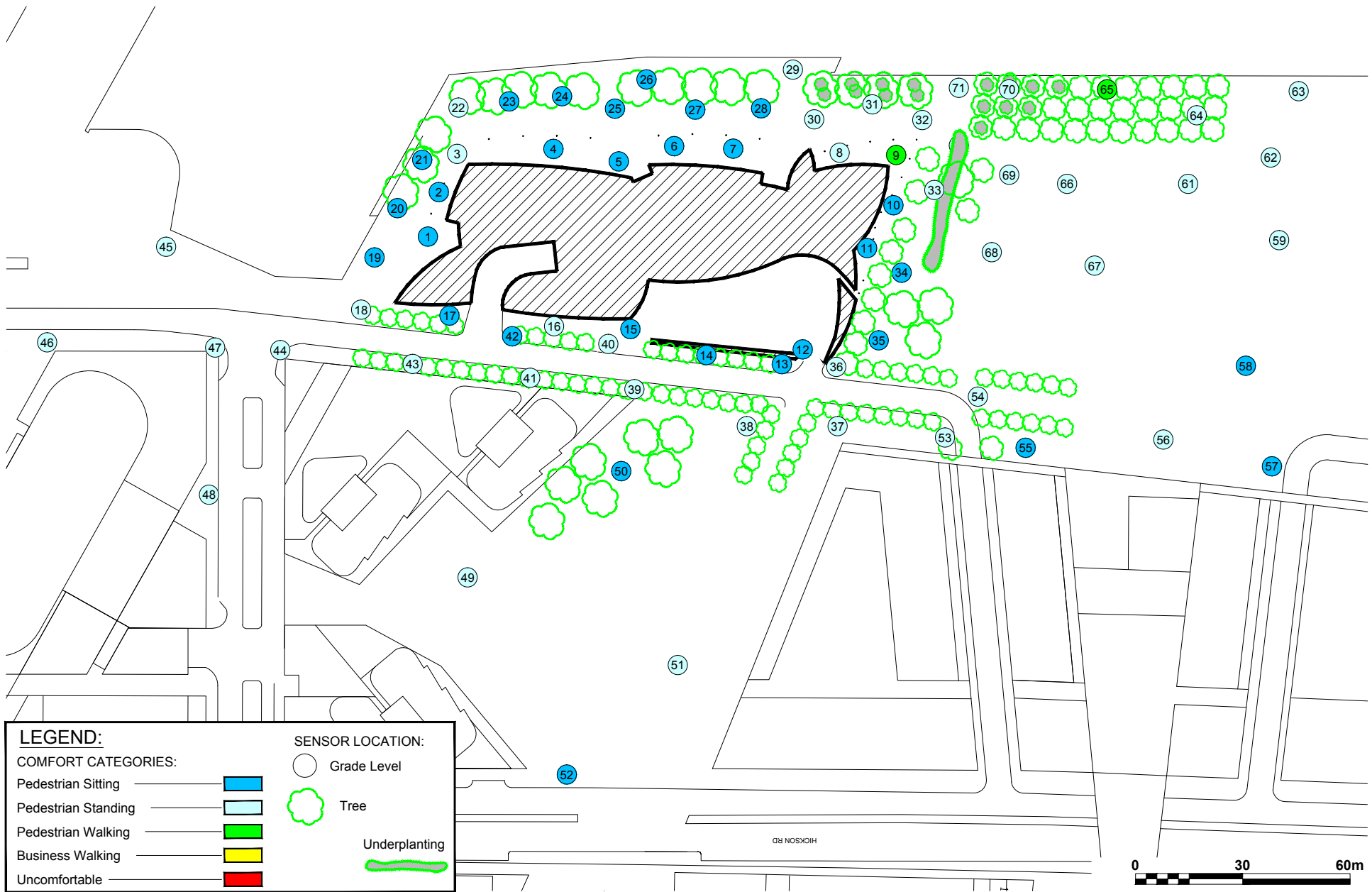
Pedestrian Wind Comfort Conditions - Revised Landscaping Plan with Pergola
 Annual (January to December, 0:00 to 23:00)
 T.V. Lawson Criteria
 Crown Tower - Sydney, Australia



Drawn by: ARM Figure: 10d
 Approx. Scale: 1:1500
 Date Revised: July 18, 2014



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LEGEND:

COMFORT CATEGORIES:

- Pedestrian Sitting — [Blue Box]
- Pedestrian Standing — [Light Blue Box]
- Pedestrian Walking — [Green Box]
- Business Walking — [Yellow Box]
- Uncomfortable — [Red Box]

SENSOR LOCATION:

- Grade Level
- ☁ Tree
- Underplanting

Pedestrian Wind Comfort Conditions - Revised Landscaping Plan with Underplanting
 Annual (January to December, 0:00 to 23:00)

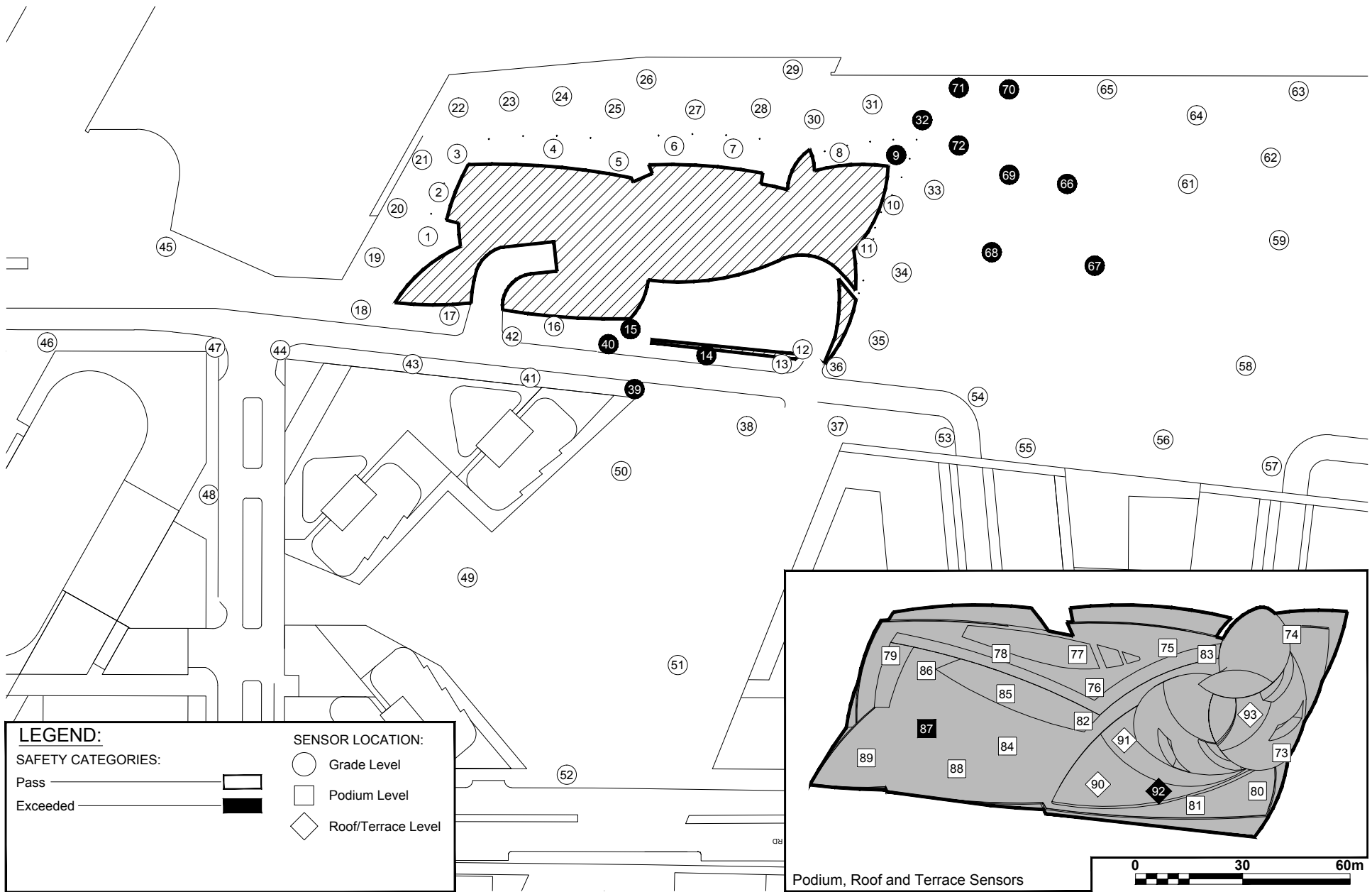
Crown Tower - Sydney, Australia



Drawn by: ARM	Figure: 10e
Approx. Scale: 1:1500	
Date Revised: July 18, 2014	

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LEGEND:

SAFETY CATEGORIES:

Pass

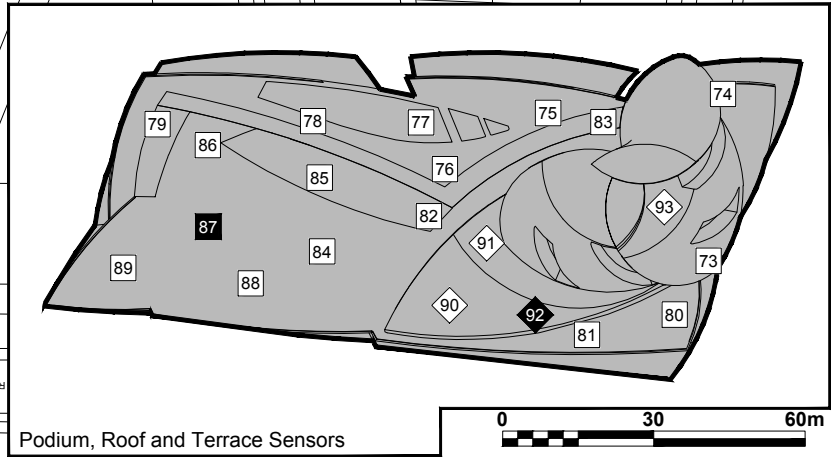
Exceeded

SENSOR LOCATION:

○ Grade Level

□ Podium Level

◇ Roof/Terrace Level



Pedestrian Wind Safety Conditions - No Landscaping
 Annual (January to December, 0:00 to 23:00)

Crown Tower - Sydney, Australia



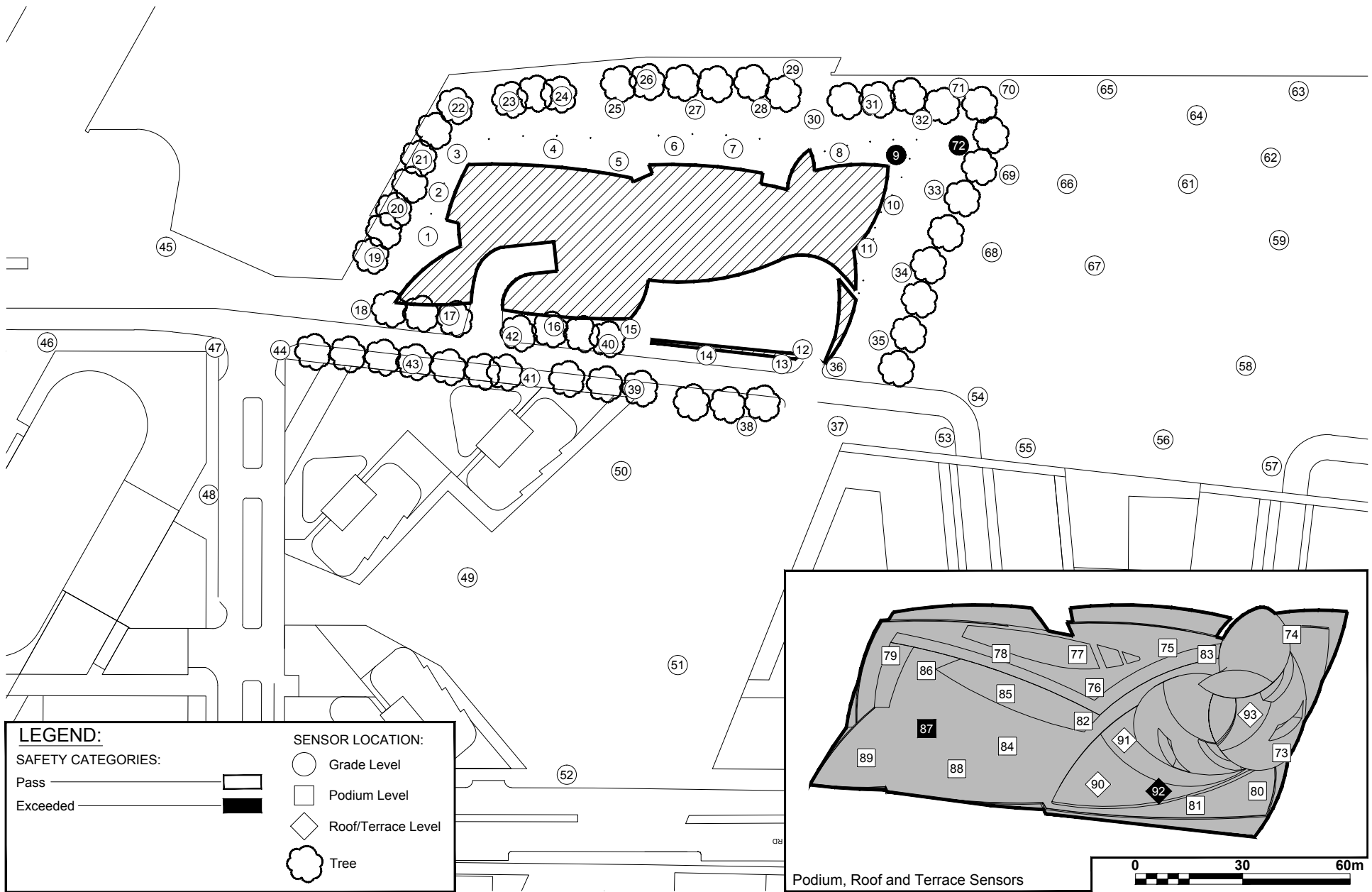
Drawn by: MDN Figure: 11a

Approx. Scale: 1:1500

Date Revised: June 24, 2014


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LEGEND:


SAFETY CATEGORIES:


Pass 


Exceeded 

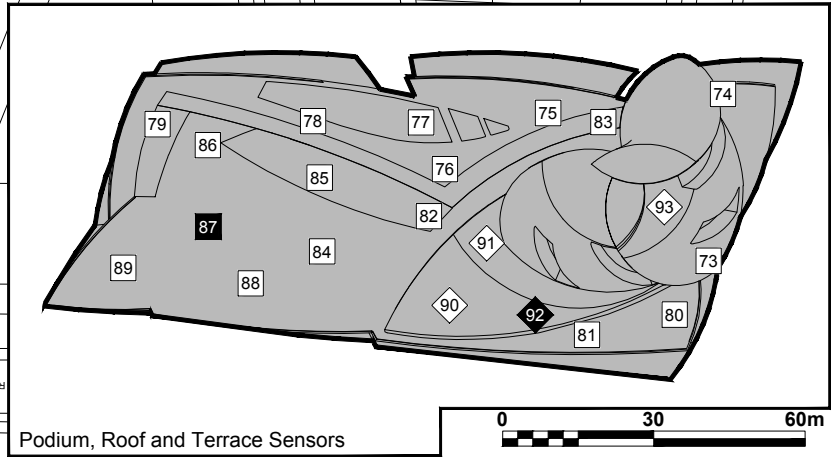
SENSOR LOCATION:

 Grade Level

 Podium Level

 Roof/Terrace Level

 Tree



Pedestrian Wind Safety Conditions - Landscaping
 Annual (January to December, 0:00 to 23:00)

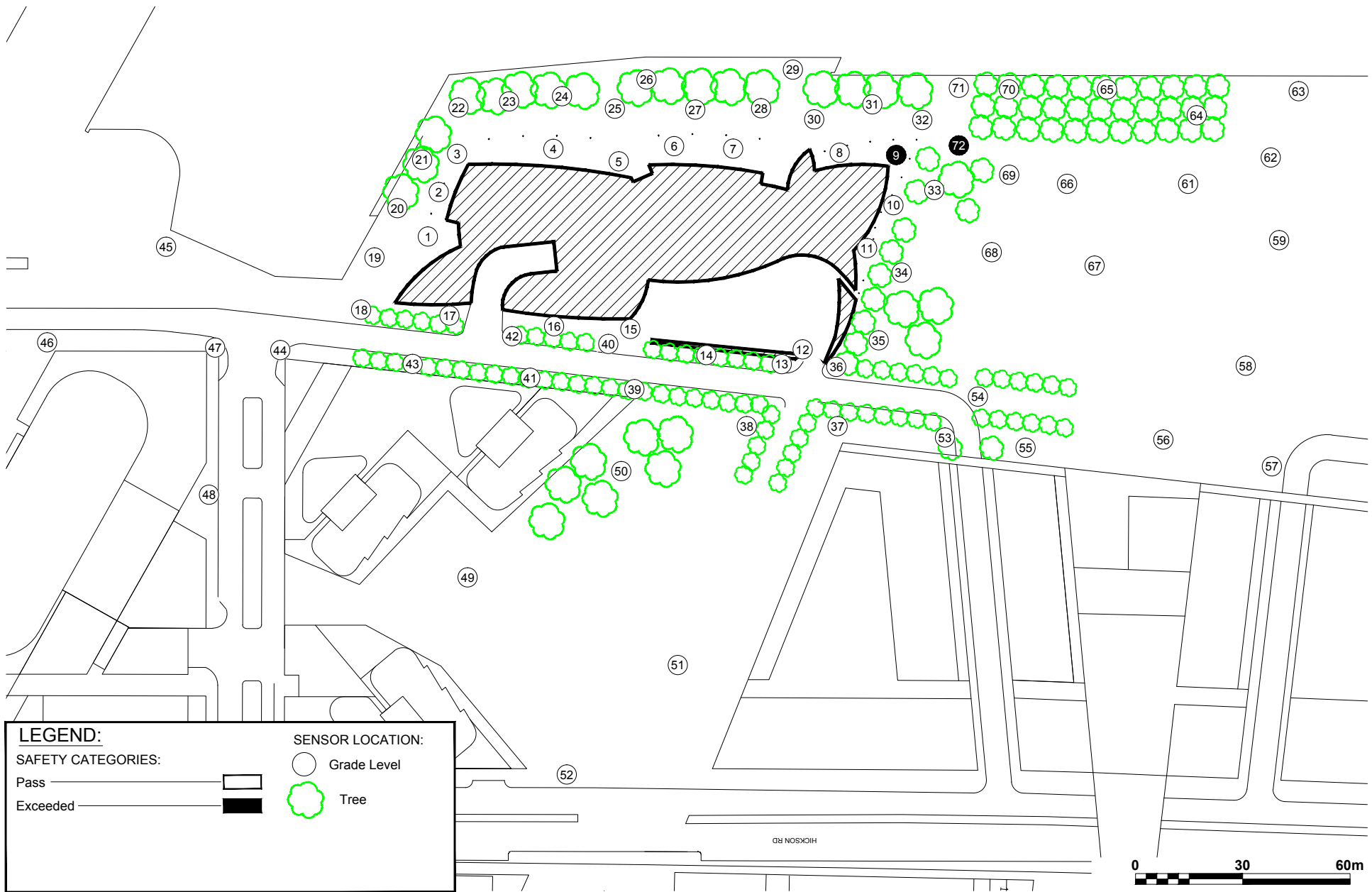
Crown Tower - Sydney, Australia



Drawn by: MDN	Figure: 11b
Approx. Scale: 1:1500	
Date Revised: June 24, 2014	

Project #1401805





LEGEND:

SAFETY CATEGORIES:
 Pass
 Exceeded

SENSOR LOCATION:
 ○ Grade Level
 ● Tree

Pedestrian Wind Safety Conditions - Revised Landscaping Plan
 Annual (January to December, 0:00 to 23:00)
 T.V. Lawson Criteria

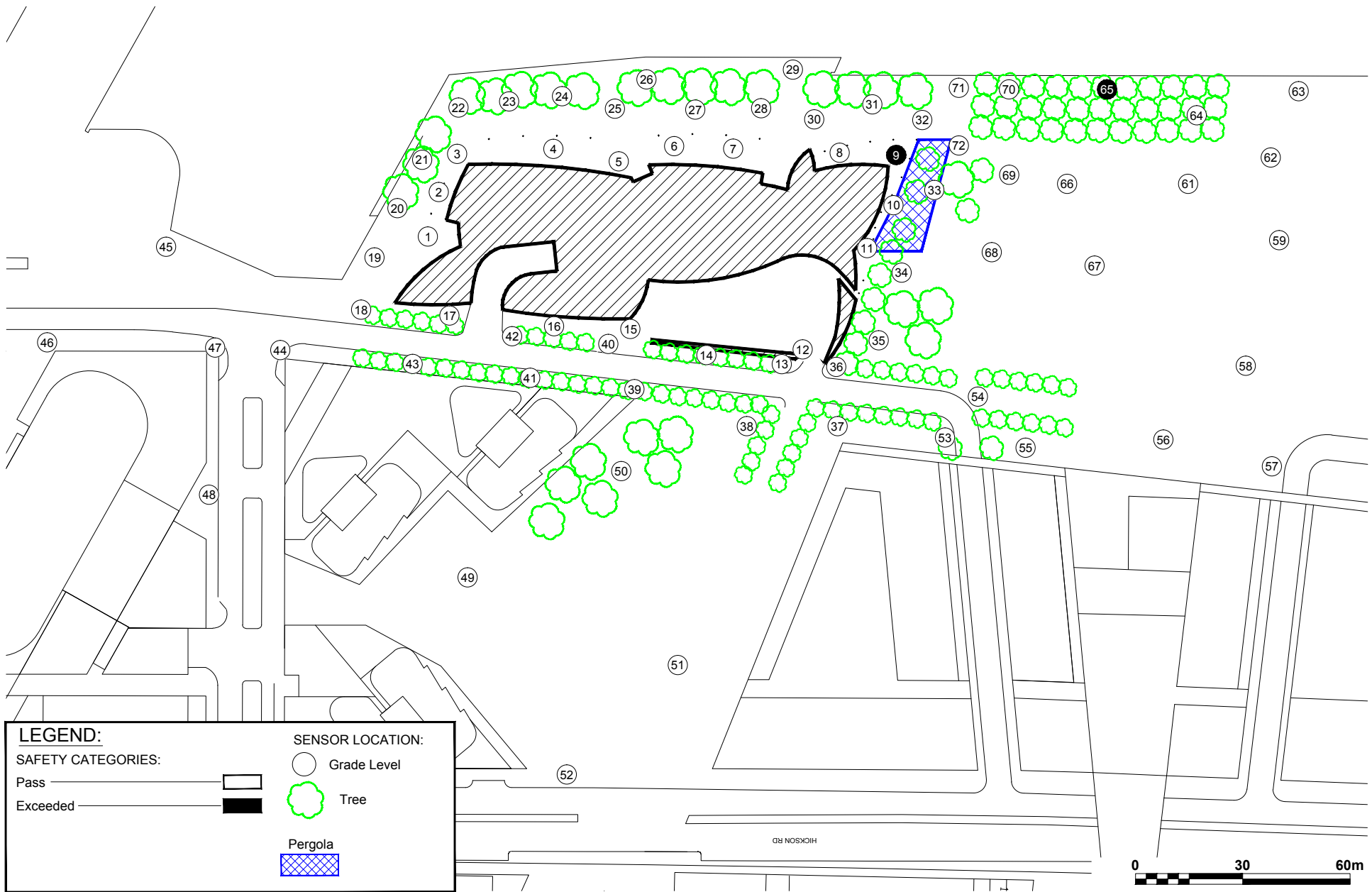
Crown Tower - Sydney, Australia





Drawn by: ARM Figure: 11C
 Approx. Scale: 1:1500
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LEGEND:

SAFETY CATEGORIES:
 Pass 
 Exceeded 

SENSOR LOCATION:
 ○ Grade Level
 ● Tree
 Pergola 



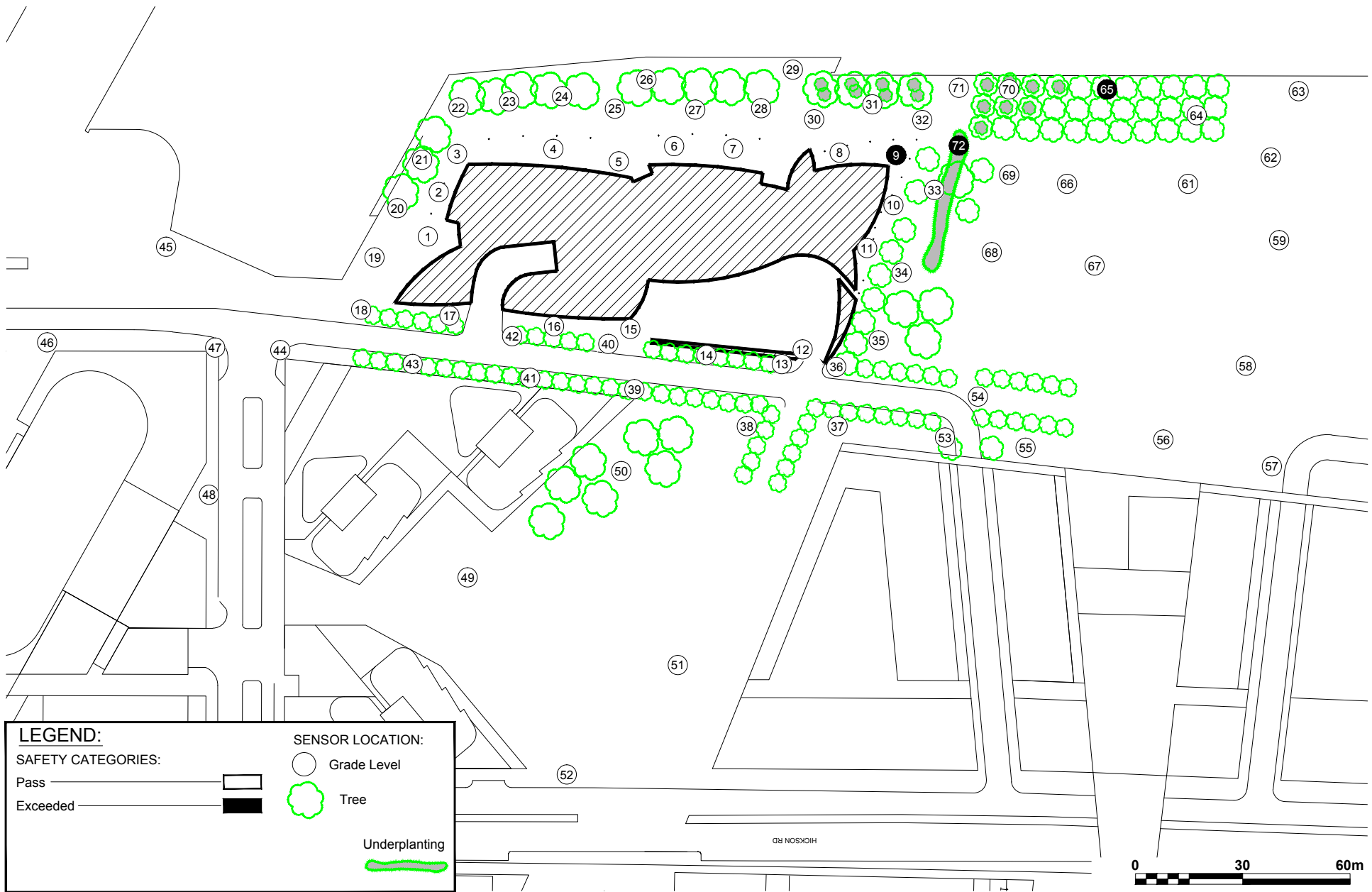
Pedestrian Wind Safety Conditions - Revised Landscaping with Pergola
 Annual (January to December, 0:00 to 23:00)
 T.V. Lawson Criteria
 Crown Tower - Sydney, Australia



Drawn by: ARM Figure: 11d
 Approx. Scale: 1:1500
 Date Revised: July 18, 2014



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LEGEND:

SAFETY CATEGORIES:

Pass

Exceeded

SENSOR LOCATION:

○ Grade Level

☁ Tree

Underplanting

Pedestrian Wind Safety Conditions - Revised Landscaping Plan with Underplanting
 Annual (January to December, 0:00 to 23:00)
 T.V. Lawson Criteria

Crown Tower - Sydney, Australia



Drawn by: ARM Figure: 11e

Approx. Scale: 1:1500

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APPENDIX A

LAWSON WIND COMFORT CRITERIA

The pedestrian wind comfort criteria used in this study were developed by T.V. Lawson at Bristol University. These criteria are well-established in the UK as the benchmark against which to assess the wind microclimate around buildings. The following categories are based on these criteria.

- **Pedestrian Sitting:** Sitting requires low wind speed where, for example, one could read a newspaper without having it blown away. Mean wind speeds of 4 m/s should not be exceeded for more than 5% of the time.
- **Pedestrian Standing:** Comfortable for standing for a short time of exposure. Mean wind speeds of 6 m/s should not be exceeded for more than 5% of the time.
- **Pedestrian Walking:** Wind speeds that would be acceptable for window shopping or strolling along a downtown street. Mean wind speeds of 8 m/s should not be exceeded more than 5% of the time.
- **Business Walking:** Wind conditions where the objective is to walk from A to B or for cycling. Mean wind speed of 10 m/s should not be exceeded more than 5% of the time.

Generally, wind conditions are considered acceptable if they produce conditions suitable for the intended activities in the area. Note that the Pedestrian Sitting category, which is the most sedentary activity for wind comfort, has the most stringent criteria.

Gust wind speeds were also used to assess the pedestrian level wind conditions on and around the proposed development site. Gust speeds are determined by dividing the recorded wind speed history into ten equal intervals (each interval is approximately six minutes in duration at full scale), finding the maximum speed for each interval and then computing the average maximum. Gust wind speeds were divided by 1.85 to obtain the Gust Equivalent Mean (GEM) which was then compared to the criteria listed above.

The onset of distress, or pedestrian safety, is defined in terms of a mean or GEM wind speed that should not be exceeded more than once per year (Annually 0.022% and Seasonally 0.04%). For most areas, where the general public are allowed, a wind speed of 15 m/s should not be exceeded. In infrequently used pedestrian areas, a more lenient criterion of 20 m/s can be applied.

RWDI WIND COMFORT CRITERIA

Comfort Category	GEM Speed (km/h)	Description
Sitting	≤ 10	Calm or light breezes desired for outdoor restaurants and seating areas where one can read a paper without having it blown away
Standing	≤ 14	Gentle breezes suitable for main building entrances and bus stops
Strolling	≤ 17	Moderate winds that would be appropriate for window shopping and strolling along a downtown street, plaza or park
Walking	≤ 20	Relatively high speeds that can be tolerated if one's objective is to walk, run or cycle without lingering
Uncomfortable	> 20	Strong winds of this magnitude are considered a nuisance for most activities, and wind mitigation is typically recommended
<p>Notes: (1) Gust Equivalent Mean (GEM) speed = $\max(\text{mean speed}, \text{gust speed}/1.85)$; and (2) GEM speeds listed above are based on a seasonal exceedance of 20% of the time between 6:00 and 23:00.</p>		
Safety Criterion	Gust Speed (km/h)	Description
Exceeded	> 90	Excessive gust speeds that can adversely affect a pedestrian's balance and footing. Wind mitigation is typically required.
<p>Note: Based on an annual exceedance of 9 hours or 0.1% of the time for 24 hours a day.</p>		

A few additional comments are provided below to further explain the wind criteria and their applications.

- Both mean and gust speeds can affect pedestrian's comfort and their combined effect is typically quantified by a Gust Equivalent Mean (GEM) speed, with a gust factor of 1.85.
- Instead of standard four seasons, two periods of summer (November to April) and winter (May to October) are adopted in the wind analysis, because in a climate such as that found in Sydney, there are distinct differences in pedestrian outdoor behaviours between these two time periods.
- Nightly hours between midnight and 5 o'clock in the morning are excluded from the wind analysis for wind comfort since limited usage of outdoor spaces is anticipated.
- A 20% exceedance is used in these criteria to determine the comfort category, which suggests that wind speeds would be comfortable for the corresponding activity at least 80% of the time or four out of five days.



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- Only gust winds need to be considered in the wind safety criterion. These are usually rare events, but deserve special attention in city planning and building design due to their potential safety impact on pedestrians.
- These criteria for wind forces represent average wind tolerance. They are sometimes subjective and regional differences in wind climate and thermal conditions as well as variations in age, health, clothing, etc. can also affect people's perception of the wind climate. Comparisons of wind speeds for different building configurations are the most objective way in assessing local pedestrian wind conditions.