bam	Technical Submission	Form: 332-203 Rev: 1

Project Title:	**Kings Cross Coal Drops Yard**	**Submission no:**	**TSE-021 Rev-01**
Job No:	**KX4389**		
To:	**Ross Macpherson**	**Company:**	**CMT**

Approval of the following equipment is required:

Equipment:	**WiFi System**
Manufacturer:	**Cisco Meraki**
Description:	**WiFi Antenna and Control System**

Specification References:

- **BAM Design Electrical Services Installation Specification KXC-M0-001BD4359-E-60-850 Dated: 01.04.2016**

Attached Detail Documents:	
Equipment specifying schedule.	WiFi Antenna Access Point
Manufacturer's quotation.	N/A
Manufacturer's details.	As Equipment Schedule
Design check calculations.	Design Responsibility will remain with Able Data
Certified performance levels.	N/A
Builderswork requirements.	To be discussed with BAM Constrcution
Assembly and installation details.	As per Manufacturers Details attached
Operation and maintenance details.	Will be provided with the O&M Manuals
List of recommended spares.	Will be provided with the O&M Manuals

Electrical requirements for equipment:

Planned site delivery: TBC

Issued by:BAM Construction Ltd.	**Colin Alabaster**	**Date**	**14/10/2016**

Please return comments by: 21/10/2016 to achieve construction delivery dates.

To be completed and returned by Consultant Design Engineer

Technical submission is ** approved / approved with comments / not approved.
(delete as appropriate)**

Returned by:		**Company:**	
Signature:		**Date:**	

This is for equipment only. Drawings and Schematics will follow for approval.

Please see BAMSE response to Hoare Lea comments:

1. Des Ops attached
2. WiFi Map attached

Wifi Comments:

The Meraki WIFI system is a cloud managed system, which means that the only kit that is installed on site is the Aerial point itself.

The external WAPs are installed with attached aerials in place, whereas the Retail wifi has the radio unit installed outside the retails unit and the aerials (4 per radio) are extended into the retail unit and connected to remote aerials.

This means that all maintenance can be done from outside the retail units.

There will be 34 External Wifi WAPs and 114 retail Wifi WAPs.

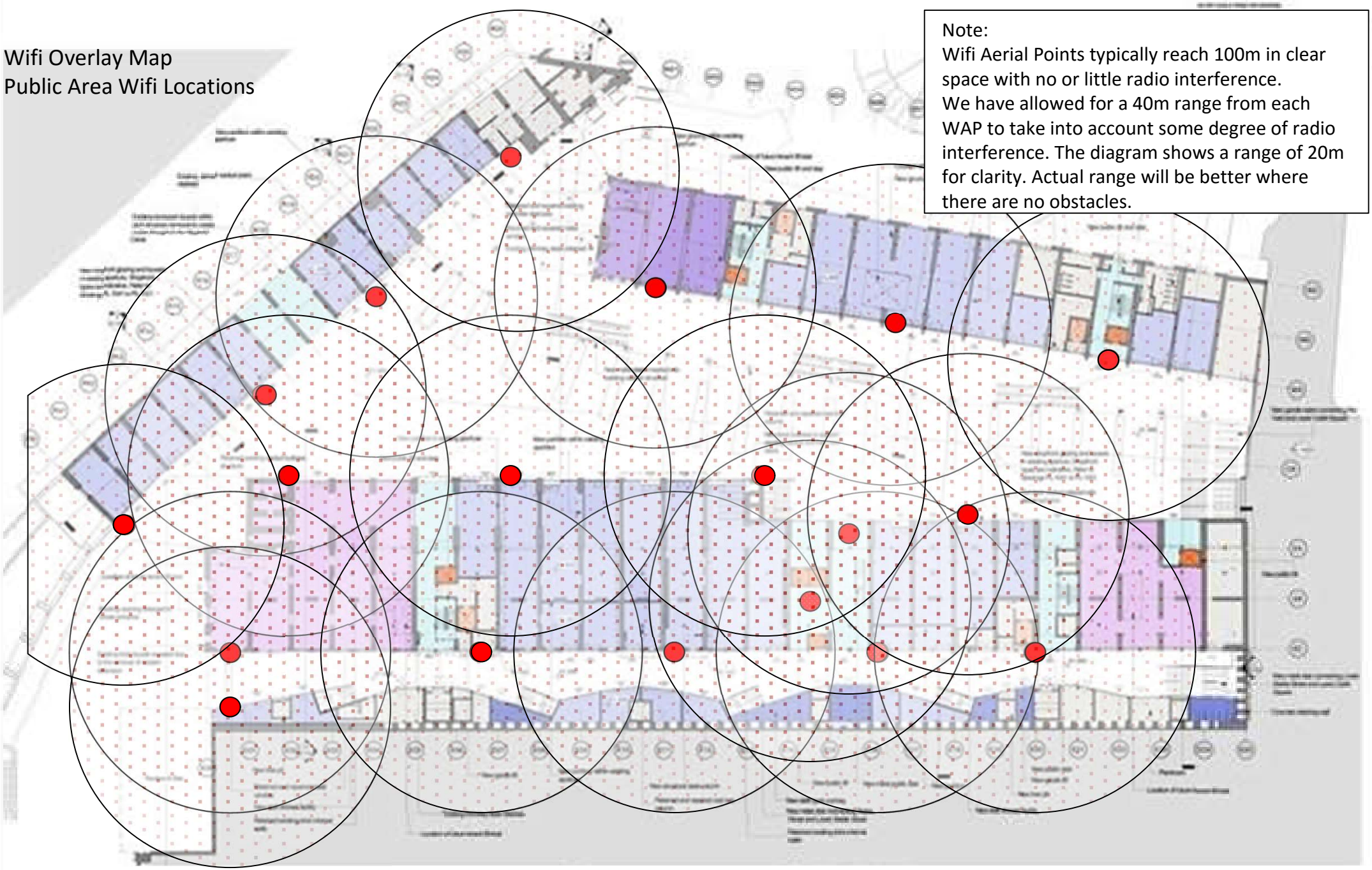
When WAP's are connectd they form an intelligent net across the site such that a person connected on a mobile device will not lose connection as he walks around but will be handed over to the nearest WAP when signal is lost from the initial WAP he was connected to.

There will be some degree of adjustment when the 'net' is up and running to minimize radio interference.

Each WAP will be connected back to the Converged Network by Cat6 data cables and patch into network ports such that it is configured onto the WLAN VLAN.

Wifi Overlay Map
Public Area Wifi Locations

Note:
Wifi Aerial Points typically reach 100m in clear space with no or little radio interference.
We have allowed for a 40m range from each WAP to take into account some degree of radio interference. The diagram shows a range of 20m for clarity. Actual range will be better where there are no obstacles.



Yard Level

Wifi Overlay Map
Public Area Wifi Locations

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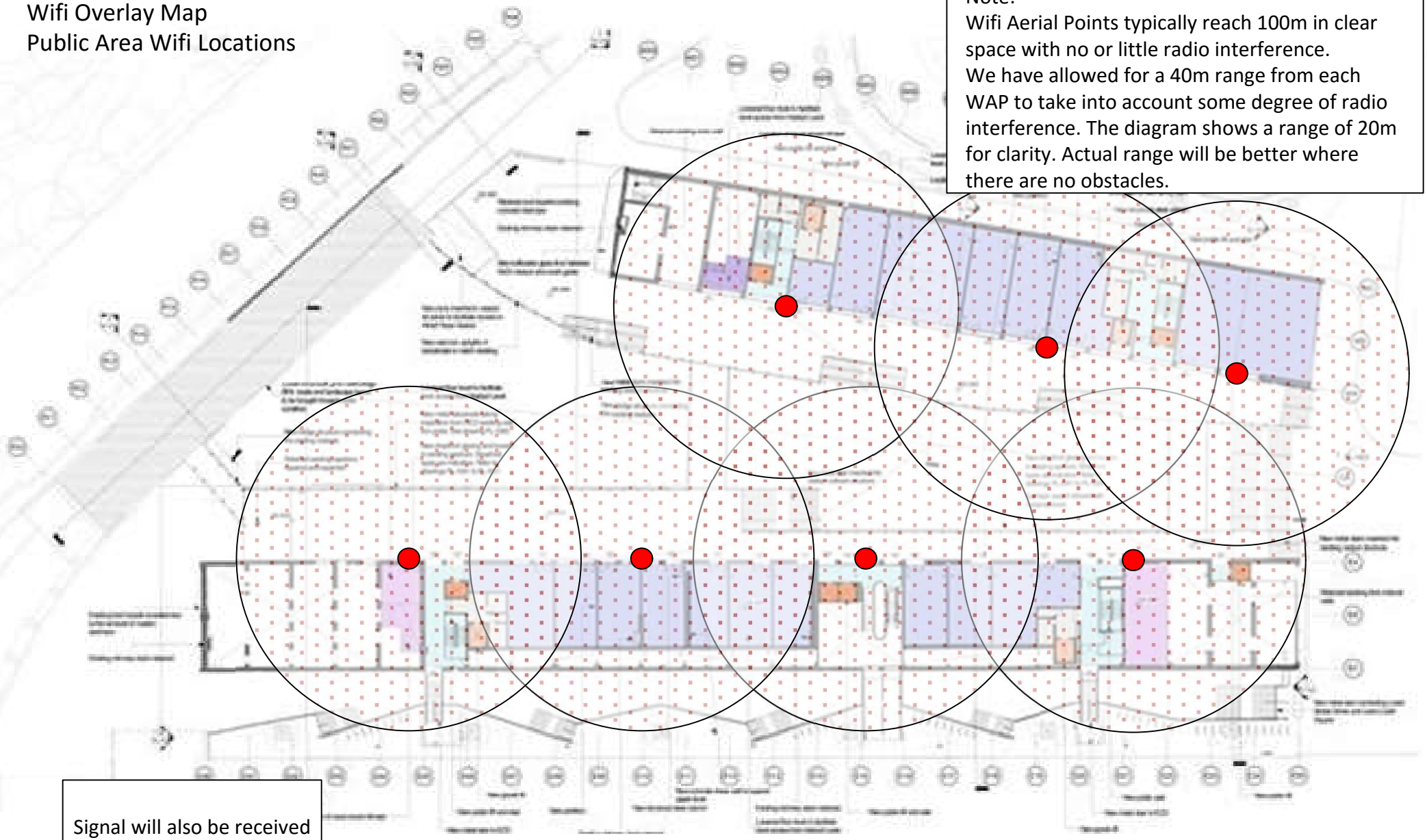
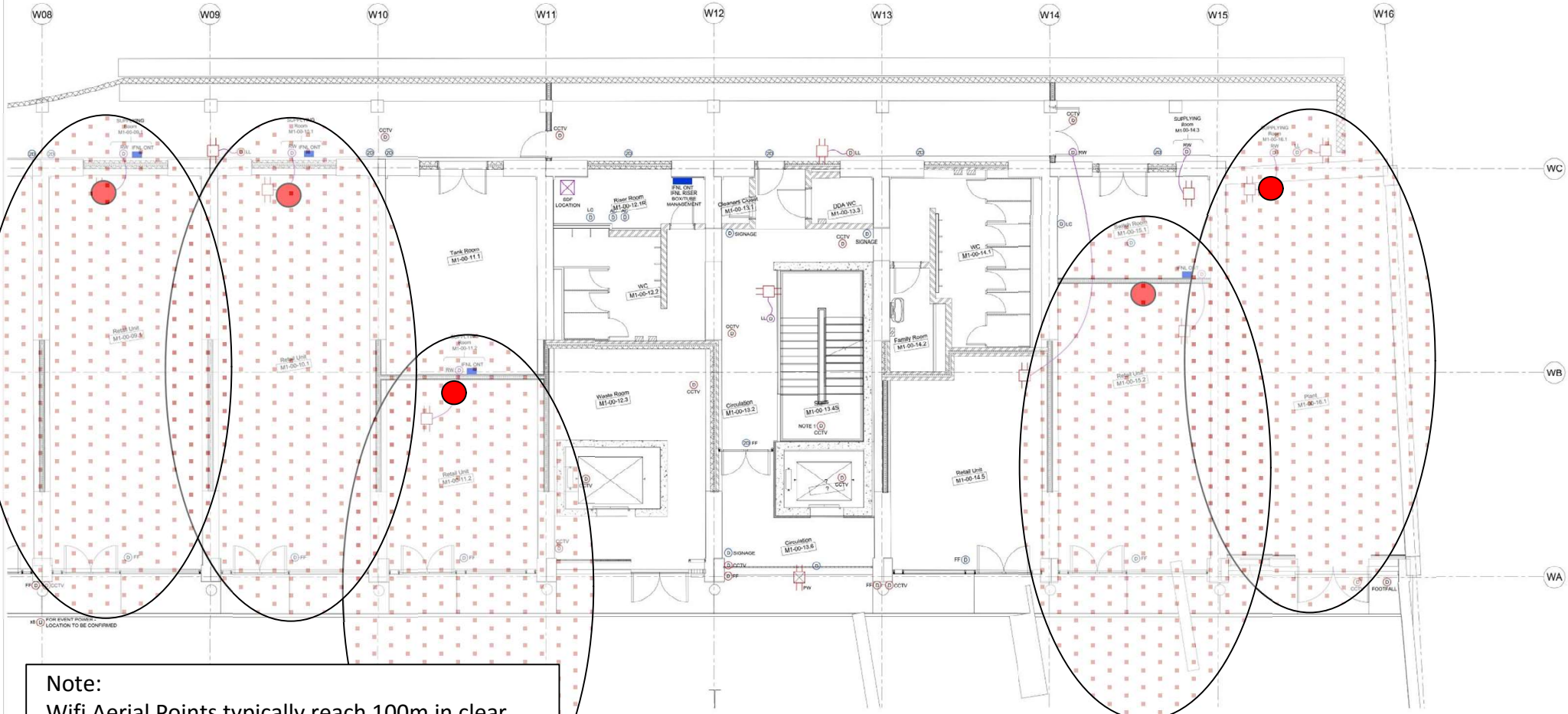


Signal will also be received from the yard level WAPS

Viaduct Level Level

Wifi Overlay Map
Retail Unit Wifi Locations



Note:
Wifi Aerial Points typically reach 100m in clear space with no or little radio interference.
We have allowed for a 40m range from each WAP to take into account some degree of radio interference. The diagram shows a range of 20m for clarity. Actual range will be better where there are no obstacles.

Typical WIFI penetration through Retail Units

TSE021 Wifi System

Approval of the following equipment is required: -

Equipment: Meraki Access Point	**Make:** Cisco
Description: The Cisco Meraki MR72 is a three–radio, cloud-managed 2x2 MIMO 802.11ac access point. Designed for general purpose next-generation deployments in harsh outdoor locations and industrial indoor conditions, the MR72 provides performance, security, and manageability.	
Spec Refs: A.14.38 Wireless LAN	**Drg. Refs.** N/A

Equipment: Meraki Antenna	**Make:** Cisco
Description: The Meraki MA-ANT-20 antenna is a multi-band, omni-directional antenna designed for use with Meraki APs that have N-type connectors.It is a versatile antenna and is suitable for a broad range of applications. The MA-ANT-20 is sold in sets of 2.	
Spec Refs: A.14.38 Wireless LAN	**Drg. Refs.** N/A

MR72

Dual-band 2x2 MIMO 802.11ac Access Point
with dedicated security and RF optimization radio
and Bluetooth low energy Beacon and scanning radio

High performance cloud-managed 802.11ac wireless

The Cisco Meraki MR72 is a three–radio, cloud-managed 2x2 MIMO 802.11ac access point. Designed for general purpose next-generation deployments in harsh outdoor locations and industrial indoor conditions, the MR72 provides performance, security, and manageability.

The MR72 provides a maximum 1.2 Gbps data rate with concurrent 802.11ac and 802.11n 2x2:2 MIMO radios, and security and spectrum visibility via a third radio dedicated to 24x7 WIDS/WIPS and automated RF optimization. An integrated Bluetooth low energy (BLE) radio delivers Beacon functionality and BLE device scanning.

The combination of cloud management, 802.11ac, full-time RF environment scanning, and an integrated Bluetooth technology delivers the high throughput, reliability, and flexibility required by the most demanding business applications like voice and high-definition streaming video, both today and tomorrow.

MR72 and Meraki cloud management: A powerful combo

The MR72 is managed through the Meraki cloud, with an intuitive browser-based interface that enables rapid deployment without training or certifications. Since the MR72 is self-configuring and managed over the web, it can even be deployed at a remote location without on-site IT staff.

The MR72 is monitored 24x7 via the Meraki cloud, which delivers real-time alerts if the network encounters problems. Remote diagnostics tools enable real-time troubleshooting over the web, meaning multi-site, distributed networks can be managed remotely.

The MR72's firmware is always kept up to date from the cloud. New features, bug fixes, and enhancements are delivered seamlessly over the web, meaning no manual software updates to download or missing security patches to worry about.

Product Highlights

- Ideal for outdoor and industrial indoor environments
- 2x2:2 802.11ac, 1.2 Gbps aggregate dual-band data rate
- 24x7 real-time WIPS/WIDS and spectrum analytics via dedicated third radio
- Integrated Bluetooth low energy Beacon and scanning radio
- Forms point-to-point links with optional sector antennas
- Self-healing, zero-configuration mesh
- Integrated enterprise security and guest access
- Application-aware traffic shaping
- Self-configuring, plug-and-play deployment

Recommended Use Cases

Outdoor coverage for high client-density corporate campuses, educational institutions, metro Wi-Fi, and parks

- Provide high-speed access to a large number of clients
- Point-to-multipoint mesh

Indoor coverage for industrial areas (e.g., warehouses, manufacturing facilities)

- Reliable coverage for scanner guns, security cameras, and POS devices
- High speed-access for iPads, tablets and laptops

Long distance point-to-point links

- Build a long-distance bridge between two networks
- Two MR72s can establish up to a 20 km link using high-gain antennas

Features

Aggregate data rate of up to 1.2 Gbps

A 5 GHz 2x2:2 802.11ac radio and a 2.4 GHz 2x2:2 802.11n radio offer a maximum combined aggregate dual-band data rate of 1.2 Gbps. Technologies like transmit beamforming and enhanced receive sensitivity allow the MR72 to support a higher client density than typical enterprise-class access points, resulting in fewer required APs for a given deployment. Band steering further enhances overall throughput, by moving 5 GHz-capable clients to the 5 GHz radio, maximizing the capacity in the 2.4 GHz range for older 802.11b/g clients.

Rugged industrial design

The MR72 is designed and tested for salt spray, vibration, extreme thermal conditions, shock and dust and is IP67 rated, making it ideal for extreme environments. Despite its rugged design, MR72 has a low profile and is easy to deploy.

Third radio dedicated to security and RF optimization

The MR72's sophisticated, dedicated dual-band third radio scans the environment continuously, characterizing RF interference and containing wireless threats like rogue access points. No more need to choose between wireless security, advanced RF analysis, and serving client data: a dedicated third radio operates without any impact to client traffic or throughput.

Bluetooth low energy Beacon and scanning

An integrated Bluetooth low energy radio provides seamless deployment of BLE Beacon functionality and effortless visibility of BLE devices within range of the AP. The MR72 enables the next generation of location-aware engagement right out of the box.

Automatic cloud-based RF optimization

The MR72's sophisticated, automated RF optimization means that there is no need for the dedicated hardware and RF expertise typically required to tune a wireless network. The real-time full-spectrum RF analysis data collected by the dedicated third radio is continuously fed back to the Meraki cloud. The Meraki cloud then automatically tunes the MR72's channel selection, transmit power, and client connection settings for optimal performance under the most challenging RF conditions.

Secure wireless environments using 24x7 Air Marshal

No longer choose between a wireless intrusion prevention system (WIPS) and serving client data: thanks to the dedicated third radio, Air Marshal, a highly optimized built-in WIPS, scans continuously for threats and remediates them as commanded, all without disrupting client service. Alarms and optional auto-containment of rogue APs are configured via flexible remediation policies, ensuring optimal security and performance in even the most challenging wireless environments.

Integrated enterprise security and guest access

The MR72 features integrated, easy-to-use security technologies to provide secure connectivity for employees and guests alike. Advanced security features such as AES hardware-based encryption and WPA2-Enterprise authentication with 802.1X and Active Directory integration provide wire-like security while still being easy to configure. One-click guest isolation provides secure, Internet-only access for visitors. Our policy firewall (Identity Policy Manager) enables group or device-based, granular access policy control.

Application-aware traffic shaping

The MR72 includes an integrated layer 7 packet inspection, classification, and control engine, enabling you to set QoS policies based on traffic type. Also included is integrated support for Wireless Multi Media (WMM), 802.1p, and DSCP. Prioritize your mission critical applications, while setting limits on recreational traffic, e.g., peer-to-peer and video streaming.

High performance mesh

The MR72's advanced mesh technologies, like multi-channel routing protocols and multiple gateway support, make it possible to cover hard-to-wire areas and improve network resilience. In the event of a switch or cable failure, the MR72 will automatically revert to mesh mode.

Self-configuring, self-optimizing, self-healing

When plugged in, the MR72 automatically connects to the Meraki cloud, downloads its configuration, and joins the appropriate network. The MR72 then self-optimizes, determining the ideal channel, transmit power, and client connection parameters. As necessary, it will also self-heal, responding automatically to switch failures and other errors.

Specifications

Radios

One 2.4 GHz 802.11b/g/n, one 5 GHz 802.11a/n/ac, one dedicated for dual-band WIPS & spectrum analysis, and one dedicated to Bluetooth low energy (2.4 GHz)

Concurrent operations of all radios

Max data rate 1.2 Gbit/s

Operating bands:

FCC (US)	CE (Europe)
2.412-2.484 GHz	2.412-2.484 GHz
5.150-5.250 GHz (UNII-1)	5.150-5.250 GHz (UNII-1)
5.725 -5.825 GHz (UNII-3)	5.250-5.350 GHZ (UNII-2)
	5.470-5.600, 5.660-5.725 GHz (UNII-2e)

802.11ac and 802.11n Capabilities

2 x 2 multiple input, multiple output (MIMO) with two spatial streams

Maximal ratio combining (MRC)

Beamforming

20 and 40 MHz channels (802.11n), 20, 40, and 80 MHz channels (802.11ac)

Packet aggregation

Power

Power over Ethernet: 37 - 57 V (802.3af compatible)

Power consumption: 13.87 W max (802.3af)

Power over Ethernet injector sold separately

Mounting

Mounts to walls and vertical poles.

Mounting hardware included

Physical Security

Security screw included

Anti-tamper cable bay

Concealed mount plate

Environment

Operating temperature: -40 °F to 140 °F (-40 °C to 60 °C)

IP67 environmental rating

Physical Dimensions

10.1" x 6.22" x 3.3" (256 mm x 158 mm x 83 mm) including mounting bracket

Weight: 3.1 lbs. (1.4 kg)

Interfaces

1 x 100/1000Base-T Ethernet (RJ45)

Four external N-type female antenna connectors

Security

Integrated policy firewall (Identity Policy Manager)

Mobile device policies

Air Marshal: Real-time WIPS (wireless intrusion prevention system) with alarms

Rogue AP containment

Guest isolation

Teleworker VPN with IPsec

PCI compliance reporting

WEP, WPA, WPA2-PSK, WPA2-Enterprise with 802.1X

TKIP and AES encryption

VLAN tagging (802.1q)

Quality of Service

Advanced Power Save (U-APSD)

DSCP

802.1p

Layer 7 application traffic shaping and firewall

Mobility

PMK and OKC credential support for fast Layer 2 roaming

L3 roaming

LED Indicators

1 power/booting/firmware upgrade status

Regulatory

RoHS

For country-specific regulatory information, please contact Meraki sales

Warranty

1 year hardware warranty with advanced replacement included

Ordering Information

MR72-HW	Meraki MR72 Cloud Managed 802.11ac AP
MA-INJ-4-XX	Meraki 802.3at Power over Ethernet Injector (XX = US/EU/UK/AU)
MA-ANT-20	Meraki Dual-Band Omni Antennas
MA-ANT-21	Meraki 5 GHz Sector Antenna
MA-ANT-23	Meraki 2.4 GHz Sector Antenna
MA-ANT-25	Meraki Dual-Band Patch Antenna

Note: Meraki Enterprise license required.

Cisco Systems, Inc. | 500 Terry A. Francois Blvd, San Francisco, CA 94158 | (415) 432-1000 | sales@meraki.com

RF Performance Table

Operating Band	Operating Mode	Data Rate	TX Power	RX Sensitivity
2.4 GHz	802.11b	11 Mb/s	19 dBm	-84
2.4 GHz	802.11g	6 Mb/s	17 dBm	-87
		54 Mb/s	17 dBm	-70
2.4 GHz	802.11n (HT20)	MCS0/8/16 HT20	18 dBm	-85
		MCS7/15/23 HT20	15 dBm	-67
2.4 GHz	802.11n (HT40)	MCS0/8/16 HT40	18 dBm	-83
		MCS7/15/23 HT40	15 dBm	-63
5 GHz	802.11a	6 Mb/s	20 dBm	-92
		54 Mb/s	18 dBm	-73
5 GHz	802.11n (HT20)	MCS0/8/16 HT20	20 dBm	-90
		MCS7/15/23 HT20	17 dBm	-70
5 GHz	802.11n (HT40)	MCS0/8/16 HT40	20 dBm	-87
		MCS7/15/23 HT40	17 dBm	-68
5 GHz	802.11ac (HT80)	VHT-MCS0/8/16 HT80	20 dBm	-84
		VHT-MCS9/15/23 HT80	15 dBm	-58

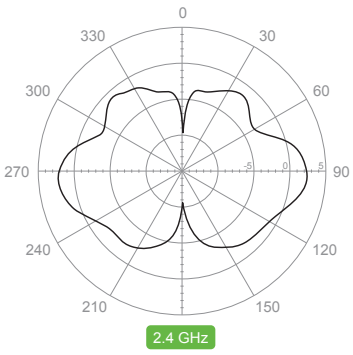
* Maximum hardware capability shown above. Transmit power is configurable in increments of 1 dB and is automatically limited to comply with local regulatory settings.

Meraki 4/7 dBi Dual-Band Omni Antenna Set (MA-ANT-20)

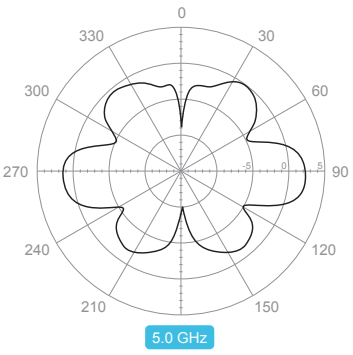
The Meraki MA-ANT-20 antenna is a multi-band, omni-directional antenna designed for use with Meraki APs that have N-type connectors. It is a versatile antenna and is suitable for a broad range of applications. The MA-ANT-20 is sold in sets of 2.

Signal Coverage Patterns

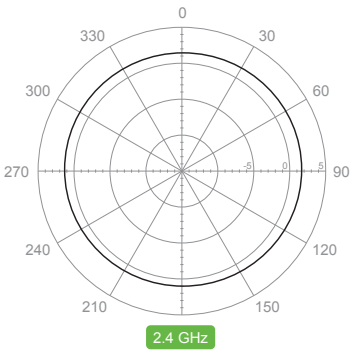
Vertical Port-1



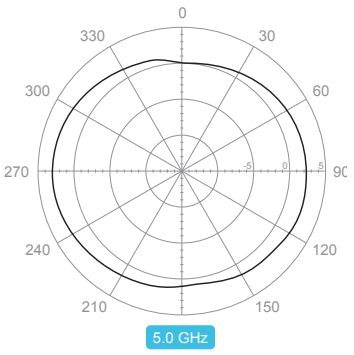
Vertical Port-2



Horizontal Port-1



Horizontal Port-2



Specifications

Electrical
Antenna type: omni-directional
Frequency range (2 GHz): 2.400 – 2.500 GHz
Frequency range (5 GHz): 5.150 – 5.875 GHz
Gain (2 GHz): 4 dBi
Gain (5 GHz): 7 dBi
Polarization: vertical (linear)
Half power beamwidth / horizontal: 360°
Half power beamwidth / vertical: 45°

Box Contents
Two Meraki MA-ANT-20 antennas

Mounting
Directly to unit (no cable required)

Physical and Environmental
Dimensions: 1.0 x 7.1" (25 mm x 180 mm)
Weight: 0.17 lbs (79 g)
Material: ABS plastic
Temperature: -40° F – 158° F (-40° C – 70° C)
Connector: N-type

Warranty
1 year hardware warranty included

Regulatory
Certified for use with the MR58, MR62, MR66, MR72