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Technical Note

Project No: ITB13349
Project Title: Tower Hill, Worthing Road
Title: Hop Oast Roundabout Review
Ref: JCB/MD/ITB13349-004B
Date: 7 June 2019

SECTION 1 INTRODUCTION

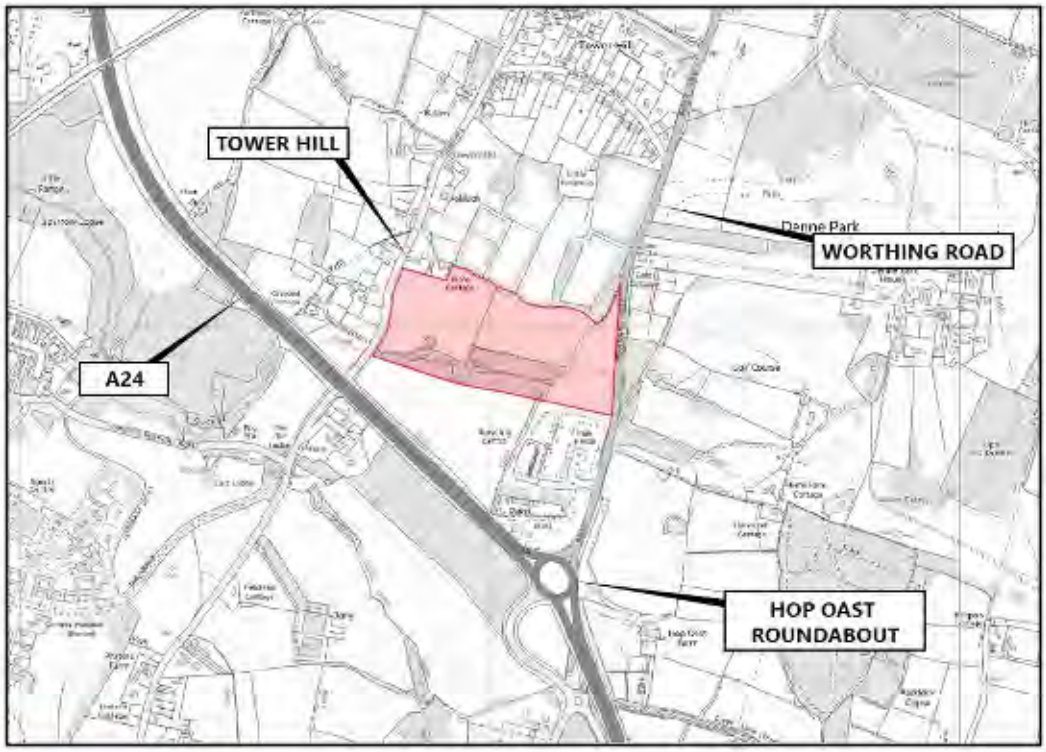
1.1 Overview

1.1.1 Wates Developments has appointed i-Transport LLP to provide highways and transport advice with regard to their site to the west of Worthing Road, in Tower Hill, Horsham. Wates are promoting the site for circa 200 dwellings.

1.1.2 The site is located to the south of Horsham town centre and north of the Hop Oast roundabout. The Hop Oast Roundabout is a four arm, unsignalised, roundabout and provides an interchange between the A24 and the B2237 Worthing Road. The B2237 Worthing Road provides connections north towards Horsham, and south towards Southwater, whilst the A24 provides connections north towards Dorking, Leatherhead and the M25 and south towards Worthing.

1.1.3 A site location plan, illustrating the location of the site and the Hop Oast roundabout, is provided at Image 1.1.

Image 1.1: Hop Oast Roundabout Site Location



1.2 Purpose

1.2.1 The Hop Oast roundabout is a key junction and route into and out of Horsham. The roundabout experiences queueing during the peak hours, on all arms, and has been subject to a number of improvement schemes which seek to increase capacity during the peak hours. Committed improvement schemes have been agreed and brought forward through two implemented planning permissions, as follows:

- Land West of Southwater (designed by WSP); and
- Land North of Horsham (designed by PBA).

1.2.2 The improvements secured through the Land West of Southwater scheme were completed in September 2018. The Land North of Horsham improvement scheme builds on the WSP scheme but has not yet been triggered by the Land North of Horsham development.

1.2.3 Whilst the modelling results of the two schemes demonstrate reasonable improvements to the operation of the junction that will improve its operation in the short term, the junction is anticipated to continue to experience capacity issues in the future 'End of Local Plan' year.

1.2.4 This note sets out the existing operation of the junction, the committed improvements schemes and sets out a further improvement scheme that will fully resolve the current queuing and delay issues at the junction.

SECTION 2 EXISTING TRAFFIC CONDITIONS – HOP OAST ROUNDABOUT

2.1 Overview

2.1.1 This section sets out the existing operation of the Hop Oast roundabout.

2.2 Turning Counts and Queue

2.2.1 A set of turning counts and queue length surveys were undertaken at the roundabout during October 2018. A summary of the peak hour traffic flows at the junction and the observed queue lengths (including average and maximum recorded vehicles) on each arm is provided in Tables 2.1 and 2.2 respectively.

Table 2.1: Traffic Flows – Hop Oast Roundabout October 2018

	PCUs
AM Peak Hour	3,831
PM Peak Hour	4,224
Average	4,028

Source: ATR and Consultant's Estimates

Table 2.2: Queue Lengths – Hop Oast Roundabout October 2018

Arm	Maximum Queue Vehicles		Average Queue Vehicles	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
A24 (N)	24	17	13	10
Worthing Rd (N)	9	36	6	20
A24 (S)	36	21	14	8
Worthing Rd (S)	13	7	6	3

Source: ATR and Consultant's Estimates

2.2.2 The turning counts during the morning and evening peak hour are illustrated in Images 2.1 and 2.2 respectively.

Image 2.1: Hop Oast Roundabout Turning Flows – AM Peak Hour

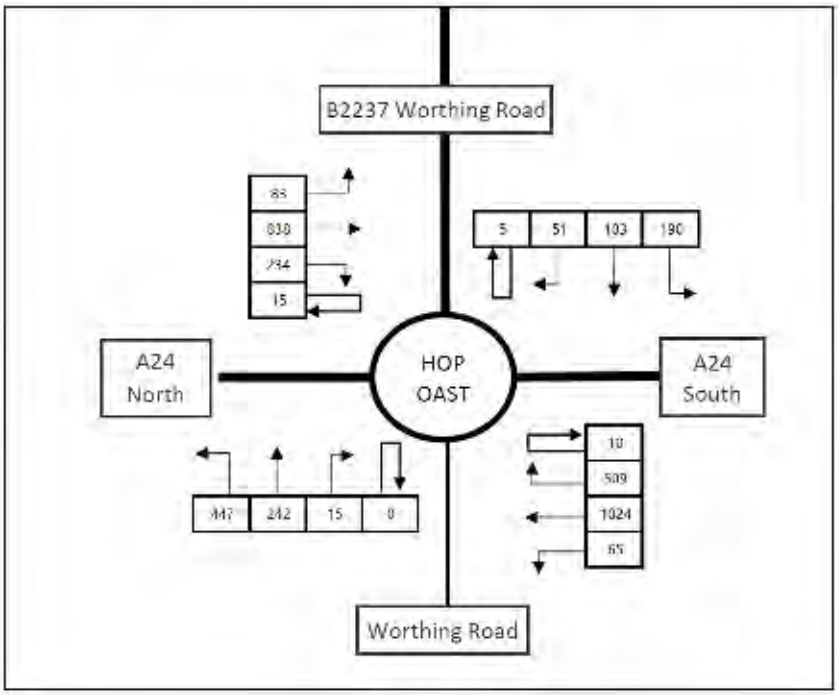
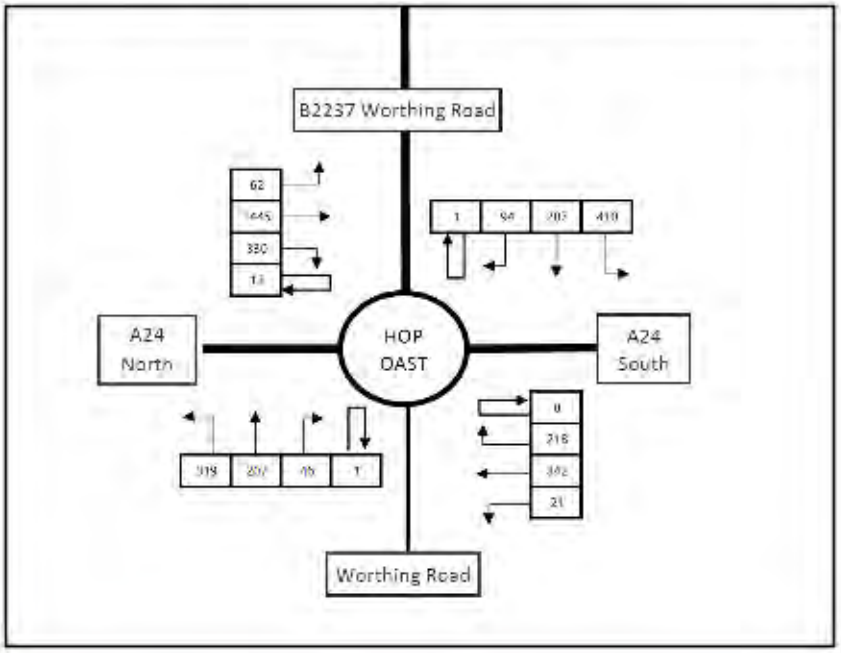


Image 2.2: Hop Oast Roundabout Turning Flows – PM Peak Hour



2.3 Committed Development Improvements

2.3.1 As part of the Land West of Southwater and land North of Horsham developments, improvements to the roundabout were agreed with WSCC. The committed improvements brought forward in both of these schemes include the following:

Land West of Southwater:

- Kerbline adjustments, including lane widening on the B2337 Worthing Road (N);
- An additional lane on the A24 (N) arm to the B2337 Worthing Road (N); and
- A new sliproad from the B2337 Worthing Road (S) to the A24 (N).

2.3.2 The proposed improvement plans are provided at Appendix A.

Land North of Horsham:

- Kerbline adjustments, including lane widening on both A24 approaches and B2337 Worthing Road (N).

2.3.3 The proposed improvement plans are provided at Appendix B.

2.3.4 In 2018, the improvements secured as part of the Land West of Southwater scheme (see Appendix A) were completed.

2.4 Existing Operational Assessments

2.4.1 An assessment of the existing capacity and operation of the roundabout has been undertaken using Junctions 9 and the traffic counts taken from 2018. The baseline operational assessments for the 2018 scenario is provided in Table 2.3. The results below are based on the recently completed improvements at the roundabout (i.e. the plans at Appendix A).

Table 2.3: Operational Assessments – Hop Oast Roundabout 2018 Baseline

	Morning Peak Hour			Evening Peak Hour		
	RFC	Queue (vehs)	Delay (s/veh)	RFC	Queue (vehs)	Delay (s/veh)
2018 Baseline – Existing Junction Layout						
A24 (N)	0.94	13	42	0.92	10	21
Worthing Rd (N)	0.87	6	64	0.98	20	103
A24 (S)	0.94	14	32	0.89	8	26
Worthing Rd (S)	0.23	<1	4	0.19	<1	3

Source: Junctions 9

2.4.2 The results demonstrate that in the 2018 observed scenarios the junction is operating above its theoretical operational capacity (i.e. over 0.85 RFC) in both peak hours with associated queueing and delaying on all arms.

2.4.3 The 2031 without and with development scenarios have been modelled using the committed Land North of Horsham improvement scheme (anticipated to be implemented by 2031). The operational assessment results of the 2031 without and with proposed development is summarised in Table 2.4.

Table 2.4: Operational Assessments – Hop Oast Roundabout 2031 Future Year

	Morning Peak Hour			Evening Peak Hour		
	RFC	Queue (vehs)	Delay (s/veh)	RFC	Queue (vehs)	Delay (s/veh)
2031 Without Development						
A24 (N)	0.59	1	4	0.86	6	10
Worthing Rd (N)	0.51	1	9	1.00	28	120
A24 (S)	0.82	5	8	0.73	3	8
Worthing Rd (S)	0.36	<1	6	0.25	<1	4
2031 With Development						
A24 (N)	0.60	2	4	0.88	7	11
Worthing Rd (N)	0.59	1	11	1.03	41	170
A24 (S)	0.84	5	9	0.74	3	8
Worthing Rd (S)	0.37	<1	6	0.26	<1	4

Source: Junctions 9

2.4.4 The operational assessment results demonstrates that the committed improvements at the junction, including the recently completed scheme by the Land West of Southwater and the Land North of Horsham development, will improve the operation of the junction and provide headroom to accommodate the increased traffic flows in the 2031 'without development' scenario in the morning peak hour, however the evening peak hour will reach theoretical maximum capacity (i.e. over 1.0 RFC), suggesting congested conditions at the junction. The addition of the proposed development traffic on top of this (i.e. an additional 200 dwellings) will have a small impact (increasing the maximum RFC of 1.00 to 1.03) in the evening peak hour. The junction will operate within capacity in the morning peak hour.

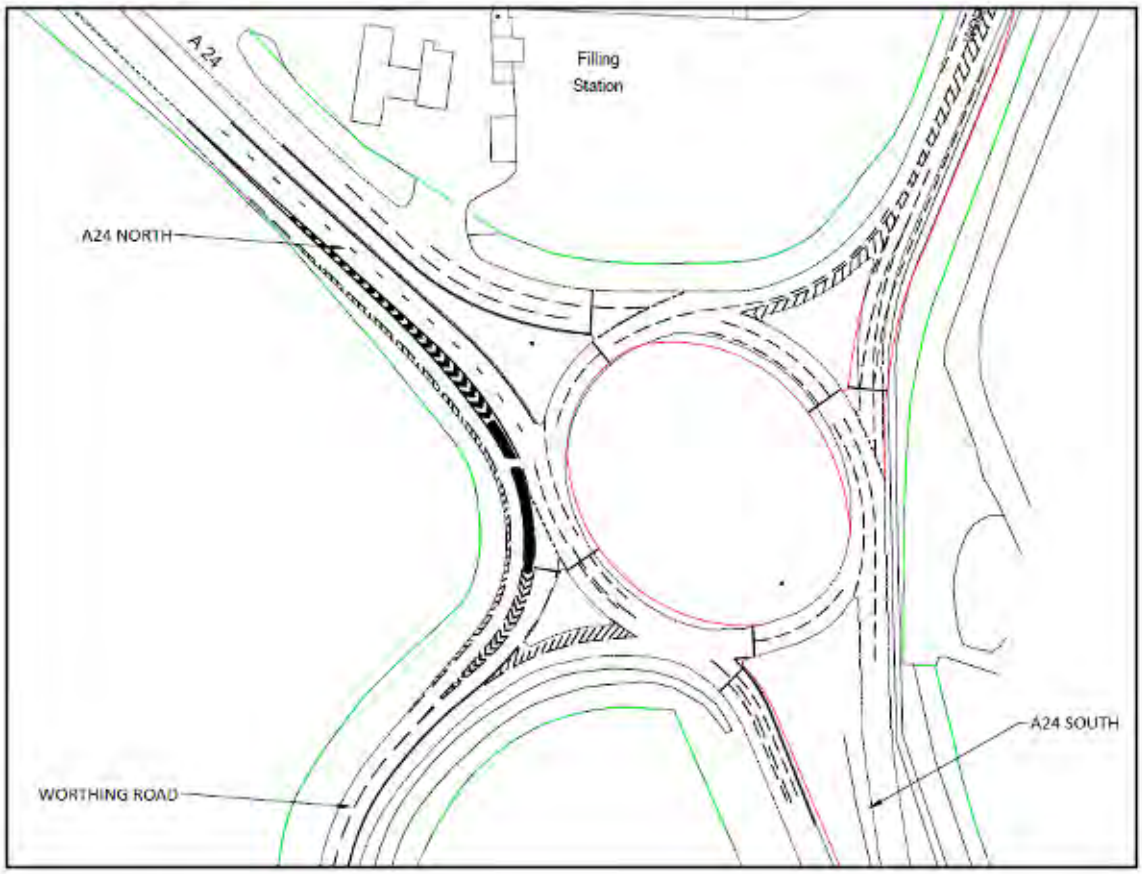
SECTION 3 POTENTIAL IMPROVEMENT SCHEME

3.1 Further Improvement Scheme

3.1.1 Whilst the two committed improvement schemes will bring forward additional capacity at the roundabout, compared to the existing/without development scenarios, the roundabout will still continue to experience capacity issues in the 2031 future year (as shown in Table 2.4). A further, more comprehensive potential improvement scheme, has therefore been designed at the junction to seek to increase capacity in the 2031 future year.

3.1.2 The proposed improvement scheme includes signalisation of the roundabout. The proposal would provide traffic signals on all external approaches to the roundabout as well as on the internal approaches (circularity carriageway). The proposed upgrade of the roundabout to traffic signalised roundabout is shown in Drawing ITB13349-GA-010, with an extract re-produced below:

Image 3.1: Hop Oast Further Improvement Scheme



3.1.3 The proposal includes the following:

- Widening of the Worthing Road (N) arm to provide a three lane approach;

- Providing a three lane circulatory carriageway on the roundabout;
- Narrowing of the ICD slightly;
- Full traffic signalisation of all approach arms to the roundabout; and
- A cycle time of 56 seconds.

3.2 Operational Assessment Results

3.2.1 The proposed signalisation of the roundabout has been modelled using LinSig for the 2031 with development scenario for the morning and evening peak hours. A summary of the operational assessment results is provided in Table 3.1.

Table 3.1: Operational Assessments – Proposed Improvement

Entry Arms	Morning Peak Hour			Evening Peak Hour		
	Deg. Of Sat	Queue (Vehs)	Delay (s/veh)	Deg. Of Sat	Queue (Vehs)	Delay (s/veh)
2031 With Development						
A24 (N)	76.6%	9	25	86.8%	15	18
B2237 Worthing Road (N)	37.6%	3	14	84.6%	9	38
A24 (S)	76.7%	11	19	86.6%	11	32
Worthing Road (S)	67.4%	6	26	46.8%	3	14

Source: LinSig

3.2.2 Table 3.1 demonstrates that the proposed upgrading of the roundabout to a traffic signalised roundabout will bring forward significant increases to the capacity of the junction in both the peak hours, including a reduction in queueing vehicles and delay. The 2031 with development scenario demonstrates the junction will operate within capacity during both peak hours.

3.2.3 The Practical Reserve Capacity (PRC) of the junction is the measure of the available spare capacity at the junction before it reaches its practical capacity. A positive PRC value indicates that there is spare capacity available, whilst a negative value suggests congested and 'overloaded' conditions at the junction. The PRC values for the 2031 with development scenario are:

- 17.3% in the morning peak hour; and
- 3.7% in the evening peak hour.

3.2.4 As such, the PRC values suggest the junction will operate in the 2031 with development scenario with circa 17% available capacity in the morning peak hour and 4% in the evening.

3.2.5 A comparison of operational assessments results of the 2031 with development scenarios for the committed improvements (see Table 2.4) and the i-Transport proposed improvement (see Table 3.1) reveals the following:

- A reduction in queuing vehicles and overall delay at the junction in the evening peak hour;
- A slight increase in queueing vehicles and delay in the morning peak hour – however well within theoretical capacity; and
- Spare capacity in the both peak hours with the i-Transport improvement scheme, including under 90% saturation in the evening peak hour.

3.2.6 Given the small level of impact of 200 dwellings on the land at Tower Hill (ref: Table 2.4), it is proposed that an appropriate financial contribution would come from any development there, to assist WSCC in bringing forward the comprehensive scheme identified above.

3.3 Sensitivity Test - Land North of the A24 and Land West of Worthing Road Development

3.3.1 In addition to the promotion of the proposed site, two additional sites (within the vicinity of the proposed site) are also being promoting through the Southwater Neighbourhood Plan. These sites are:

- To the south of Wates' proposed site, an employment development promoted by Gerald Eve, identified as 'Land North of the A24 and East of Tower Hill' in the Neighbourhood Plan; and
- To the north of Wates' proposed site, a residential development for the elderly promoted by W.T. Lamb Holdings, identified as 'Land to the West of Worthing Road' in the Neighbourhood Plan.

3.3.2 Whilst the Land North of the A24 site is being promoted for employment, the site also has the opportunity to provide residential development. It is estimated that the site could yield some 170 dwellings. The Land West of Worthing Road is being promoted for elderly residential use. The promotion pack includes two main options; one a mix of retirement units and a care home and the other just retirement units.

3.3.3 The estimated trip generation of both of these sites has been calculated and have been distributed and assigned onto the local highway network using the same assumptions as per the proposed Wates' development traffic.

3.3.4 The operational assessments have been updated with the additional flows at the roundabout for both the committed development layout and proposed improvement scheme. The resultant 2031 with development flows are summarised in Tables 3.2 and 3.3.

Table 3.2: Operational Assessment – Committed Development Layout (with additional Land North of the A24 and Land West of Worthing Road)

Entry Arms	Morning Peak Hour			Evening Peak Hour		
	RFC	Queue (Vehs)	Delay (s/veh)	RFC	Queue (Vehs)	Delay (s/veh)
2031 With Development						
A24 (N)	0.61	2	4	0.90	9	13
B2237 Worthing Road (N)	0.66	2	13	1.07	66	261
A24 (S)	0.85	6	11	0.75	3	8
Worthing Road (S)	0.39	1	6	0.26	0	4

Source: Junctions 9

3.3.5 The operational assessment results demonstrate the committed improvements at the junction will accommodate the increased traffic flows in the 2031 with development scenario (with the additional two other sites) in the morning peak hour. During the evening peak hour, the junction will reach theoretical capacity, suggesting congested conditions.

3.3.6 A comparison of the modelling results, without the addition of the two other neighbourhood plan sites (see Table 2.4), reveals the additional traffic generated by the two other neighbourhood sites will show a minor increase in the queueing vehicles and delays during the peak hours.

Table 3.3: Operational Assessment – Proposed Improvement (with additional Land North of the A24 and Land West of Worthing Road)

Entry Arms	Morning Peak Hour			Evening Peak Hour		
	Deg. Of Sat	Queue (Vehs)	Delay (s/veh)	Deg. Of Sat	Queue (Vehs)	Delay (s/veh)
2031 With Development						
A24 (N)	80.0%	10	23	87.7%	14	16
B2237 Worthing Road (N)	49.7%	5	28	86.3%	9	41
A24 (S)	80.2%	10	15	86.6%	11	32
Worthing Road (S)	69.8%	5	22	44.2%	3	13

Source: LinSig

3.3.7 The operational assessment results demonstrate the addition of the two other neighbourhood plan sites will not result in a material impact on the operation of the improved junction compared to the modelling results without the additional sites (see Table 3.1).

3.3.8 The modelling results reveal the proposed improvements at the junction will accommodate the traffic associated with the proposed Wates' development (200 dwellings), potential development on the land north of the A24 site (170 dwellings) and potential development on the land west of Worthing Road (131 retirement units and a care home).

SECTION 4 SUMMARY

4.1 Wates Developments has appointed i-Transport to provide highways and transport advice with regard to their site on the land west of Worthing Road, Tower Hill, Horsham. The site is being promoted for circa 200 dwellings.

4.2 The site is located to the north of the Hop Oast roundabout. The Hop Oast roundabout is a key junction providing connections to the A24 and routes into and out of Horsham and Southwater. The junction is a large four arm roundabout and is observed to experience queues and delays during the peak hours, particularly in the evening. The observed traffic flows at the junction (taken from 2018) have been modelled in Junctions 9 which illustrates the junction is currently operating over its operational capacity.

4.3 The roundabout has been/will be subject to two local committed development improvements works, brought forward by the Land West of Southwater and Land North of Horsham developments. The improvements committed as part of the Land West of Southwater scheme have recently been completed at the roundabout (September 2018).

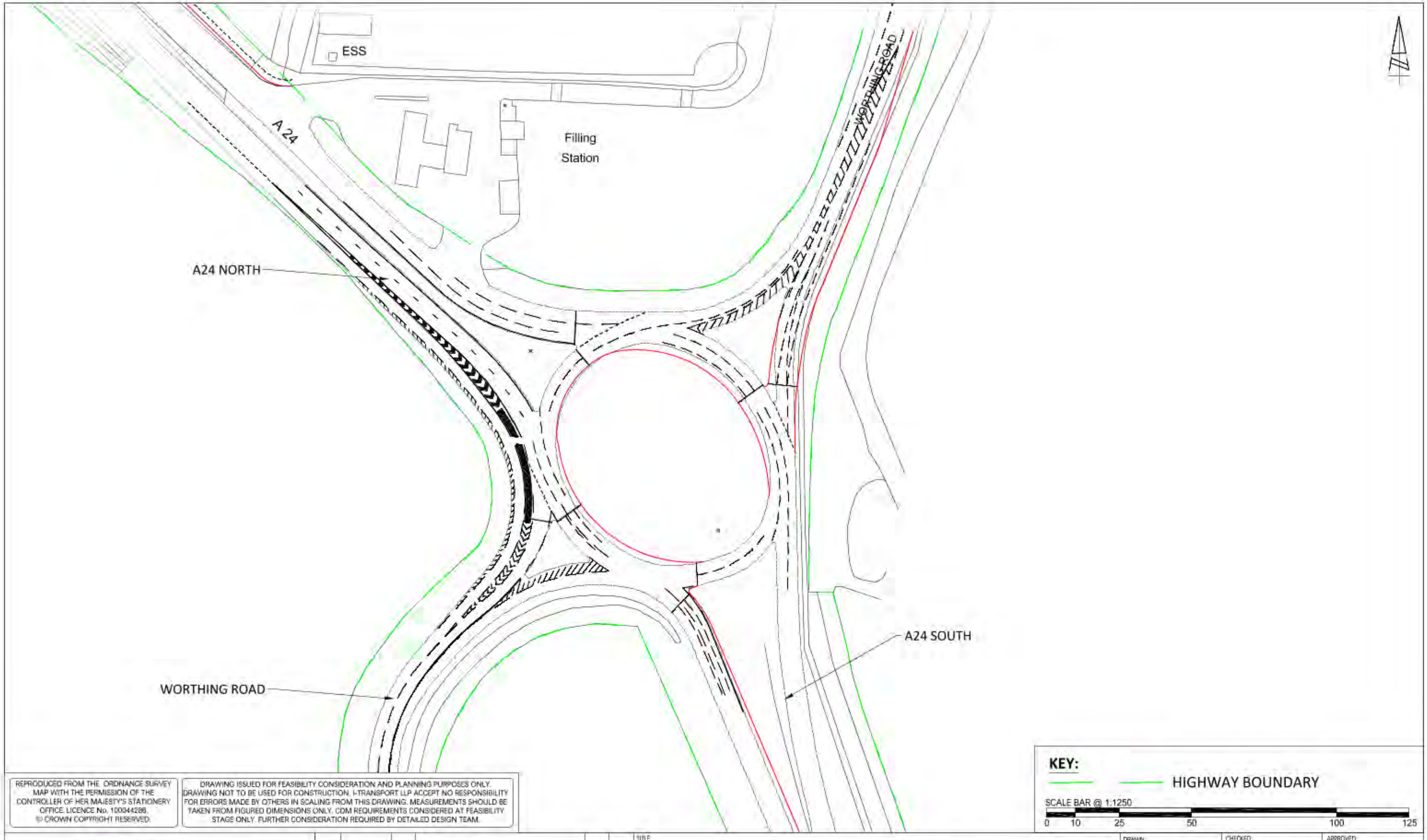
4.4 The junction has been modelled with the 2018 observed flows and for a 2031 future year. The results of the junction modelling, with the committed improvements, demonstrate that whilst the committed developments bring forward extra capacity, the junction is anticipated to experience delays in the 2031 future year. It is predicted to operate over maximum capacity by the end of the local plan period whether or not development of the Wates' site occurs.

4.5 Therefore, a review of a comprehensive improvement scheme at the junction has been undertaken. Signalising and widening the approaches to the junction will significantly increase capacity resulting in the junction operating with spare capacity, and therefore much reduced queuing and delay, in the 'End of Local Plan' assessment year of 2031.

4.6 An additional sensitivity test has been undertaken, which includes the traffic associated with two other neighbourhood plan sites, one to the north and the other to the south of the Wates' site. The modelling results demonstrate the comprehensive improvement scheme at the junction will continue to operate within capacity, with reductions in queueing and delay from the current situation, with the additional traffic generated by the two additional neighbourhood plan sites.

4.7 Given the small level of impact of 200 dwellings on the land at Tower Hill, it is proposed that an appropriate financial contribution would come from any development of the Wates site. This would be used by WSCC to help bring forward the comprehensive scheme needed to resolve queuing and delay issues at the Hop Oast roundabout.

DRAWING



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REV	DATE	BY	DESCRIPTION	CHK	APD

STATUS: FOR INFORMATION

TITLE: HOP OAST ROUNDABOUT
POTENTIAL SIGNALISATION SCHEME

PROJECT: TOWER HILL HORSHAM

CLIENT: WATES

DRAWN	CHECKED	APPROVED
JMc	MD	JCB

SCALE @ A3	DATE
1:1250	25.03.19

PROJECT No.: ITB13349

DRAWING No.: ITB13349-GA-010

REV: -

APPENDIX A. LAND WEST OF SOUTHWATER – HOP OAST ROUNDABOUT IMPROVEMENT SCHEME

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A	10/03/14	LEW	FIRST ISSUE	SA	KK

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PROJECT:
LINTOT PARK, SOUTHWATER

TITLE:
HOP OAST ROUNDABOUT -
PROPOSED JUNCTION IMPROVEMENTS

SCALE @ A3:	CHECKED:	APPROVED:
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0398-SK-14	LEW	March 2014
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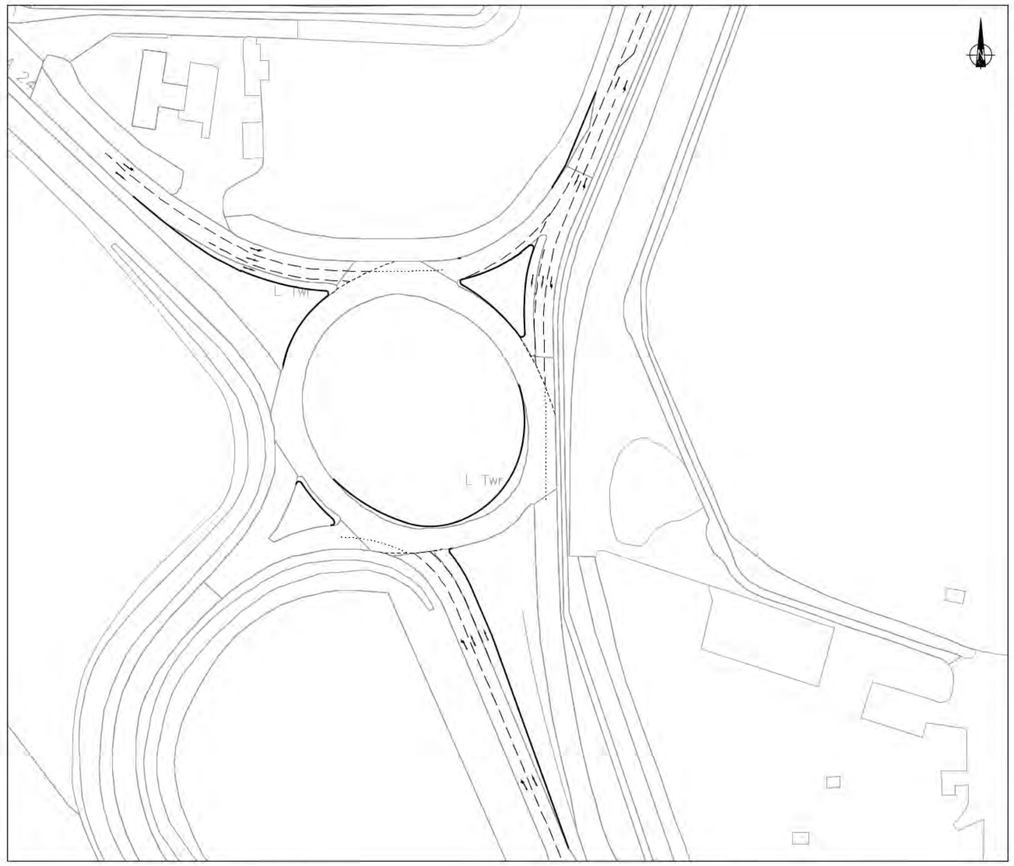
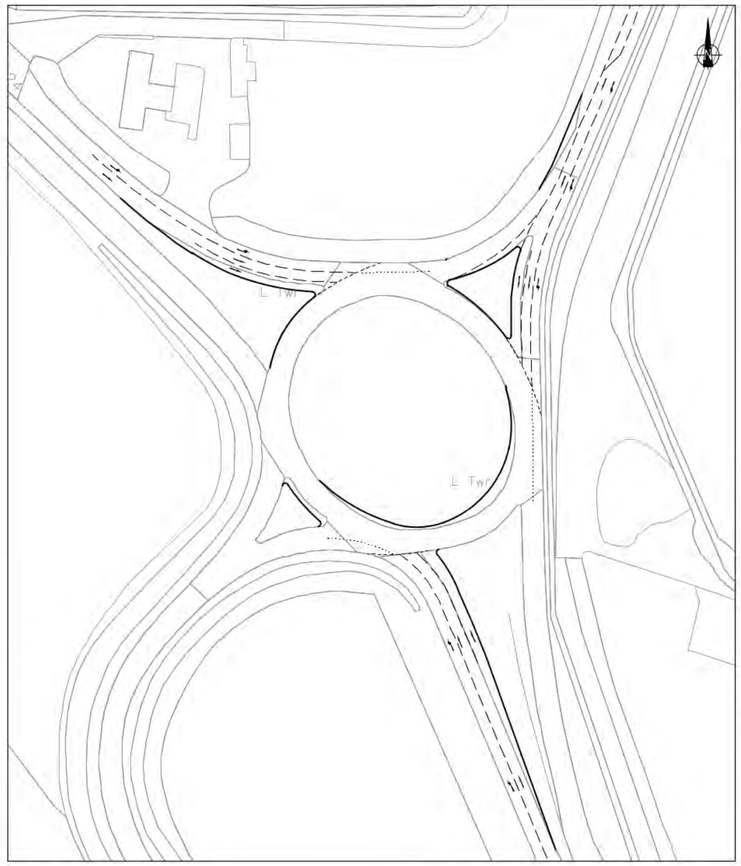
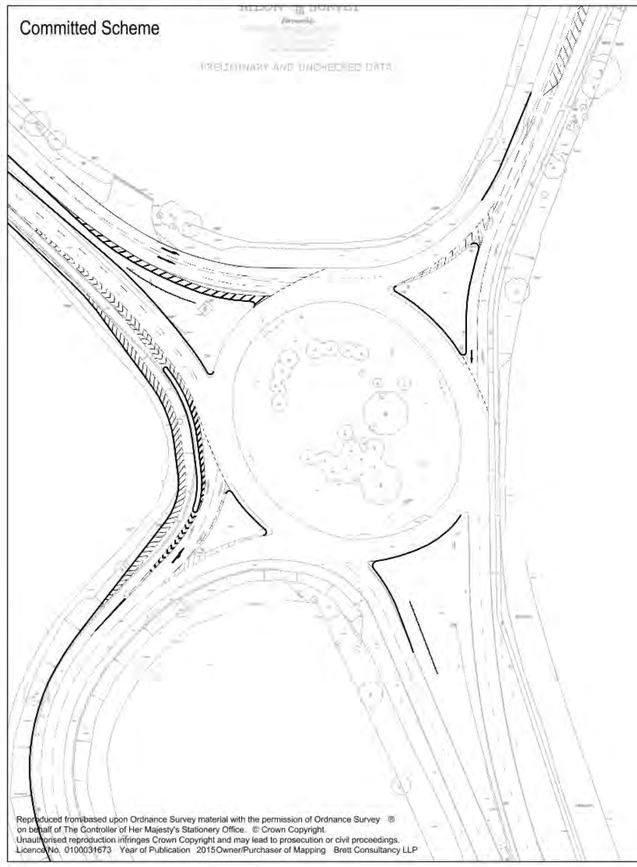
APPENDIX B. LAND NORTH OF HORSHAM – HOP OAST ROUNDABOUT IMPROVEMENT SCHEME





Committed Scheme



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A	10/03/14	LEW	FIRST ISSUE		

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PROJECT: LINTOT PARK, SOUTHWATER

TITLE: HOP OAST ROUNDABOUT - PROPOSED JUNCTION IMPROVEMENTS

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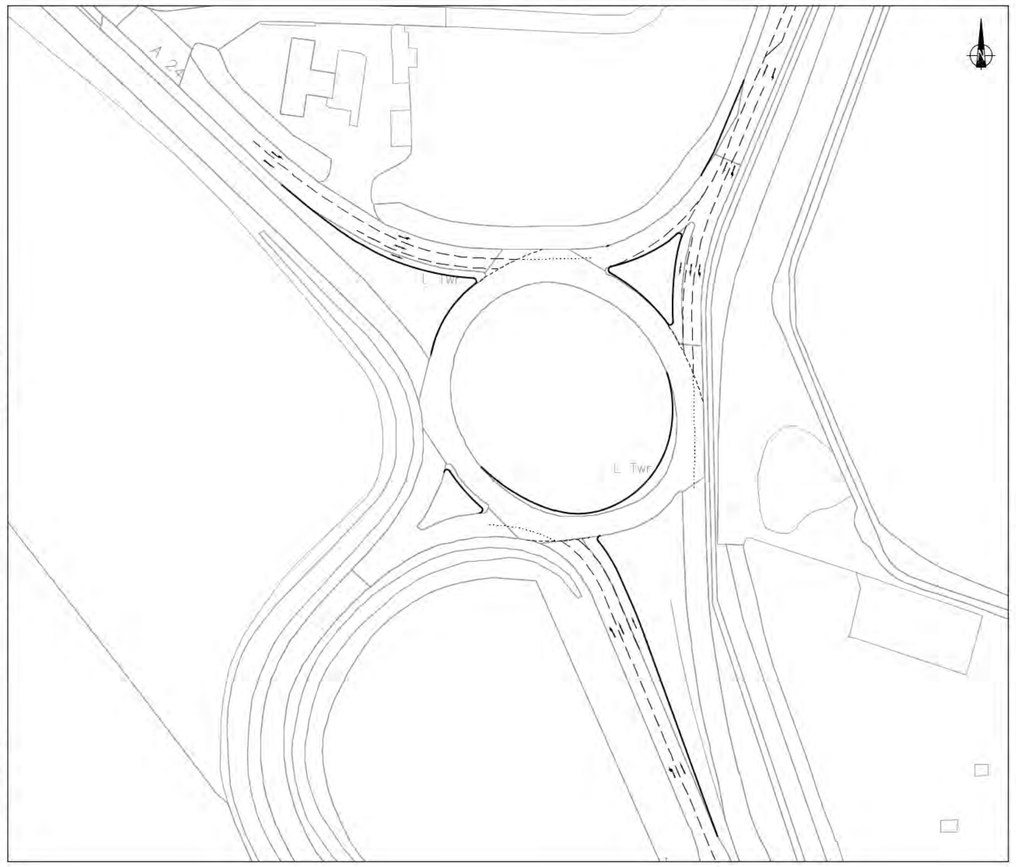

Mark	Revision	Date	Drawn	Chkd	Appd
A	Updated based on WSCC Comments	29.07.15	PR	DH	SM

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Drawing Issue Status: FOR PLANNING

Land North of Horsham, Highway Mitigation Scheme, Hop Oast

Client: LIBERTY PROPERTY TRUST

Date of 1st Issue	Designed	Drawn
22.05.2015	PR	PR
A1 Scale	Checked	Approved
1:1000	DH	SM
Drawing Number		Revision
25216/5506/016		A

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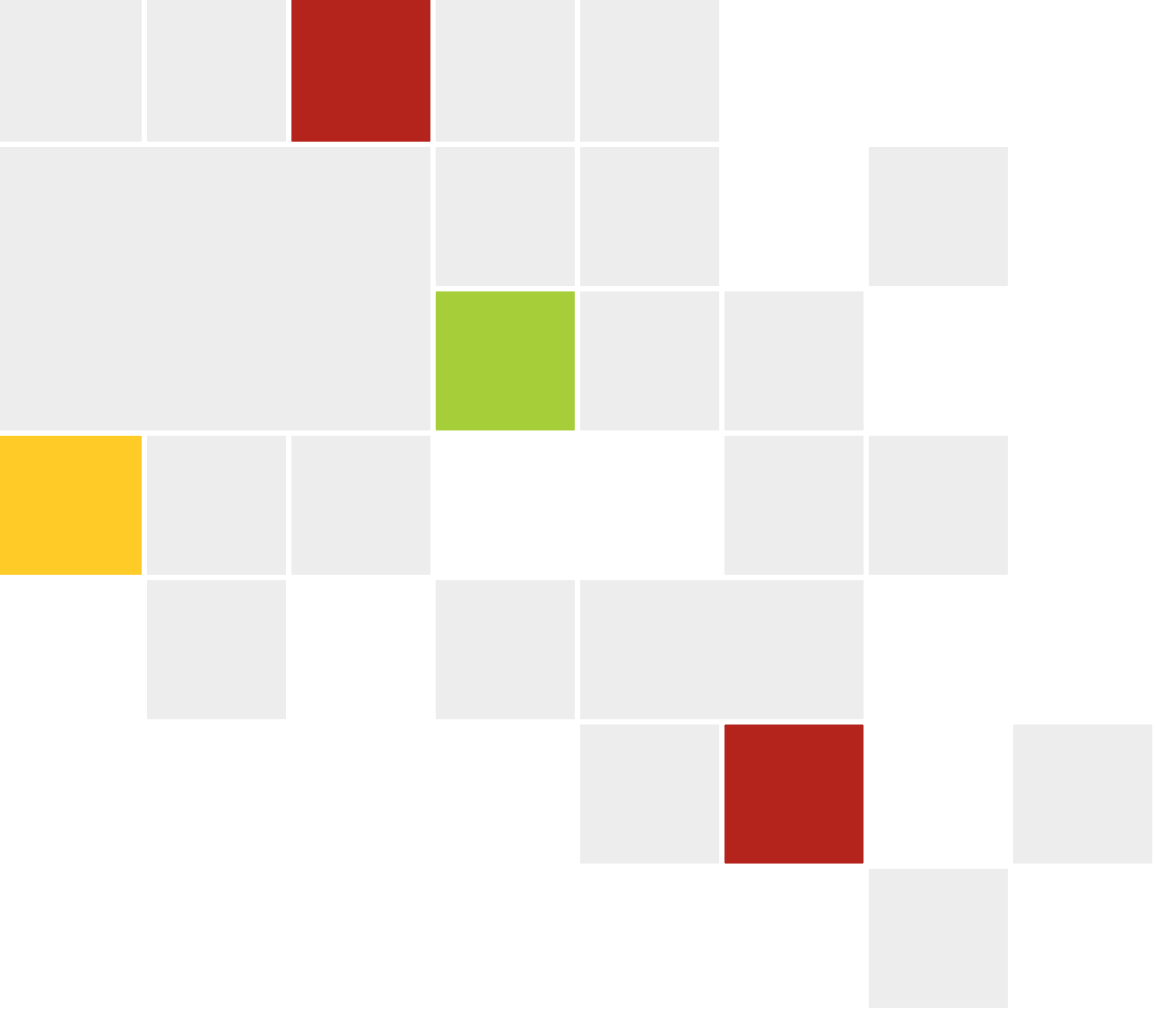

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