#### Staff Report

#### SOUTH DUFF ACCESS STUDY FINDINGS

#### December 10, 2013

#### Background:

On June 11, 2013, City Council referred to staff a letter from Chuck Winkleblack regarding access management on South Duff Avenue from South 5<sup>th</sup> Street to approximately Squaw Creek. Mr. Winkleblack is redeveloping several properties along the east side of South Duff. The letter asked City Council to direct staff to conduct a study of the corridor, evaluating the consolidation of several access drives along both the east and west sides of the street into a single signalized intersection. The purpose of the proposed changes is to improve traffic safety and efficiency along Ames' highest volume roadway.

On June 17, 2013, staff held a coordination meeting with Iowa Department of Transportation (DOT) staff, property owners, and developers who would be affected by a consolidation of access points. With support of the property owners and the Iowa DOT, City staff presented the proposed study to City Council on July 9, 2013. The outcome of that meeting was City Council directing staff to conduct the access study and traffic signal warrant analysis. This report summarizes the findings and recommendations of that study.

#### Study Findings:

As decided during the initial scoping meeting with the Iowa DOT, staff collected ninehour continuous turning movement counts during the month of September 2013 at the following signalized intersections and drive accesses within the study area (see Attachment 1):

#### Signalized Intersections:

- a. S. Duff Ave. and S. 3<sup>rd</sup> Street
- b. S. Duff Ave. and S. 5<sup>th</sup> Street
- c. S. Duff Ave. and Chestnut Street

#### Private Driveways:

- d. Texas Roadhouse north drive with S. 5<sup>th</sup> Street
- e. Texas Roadhouse east drive with S. Duff Ave.
- f. Wal-Mart northwest drive with S.E. 5<sup>th</sup> Street
- g. Wal-Mart north drive with S.E. 5<sup>th</sup> Street (across from Target)
- h. Wal-Mart northeast drive with S.E. 5<sup>th</sup> Street (access to loading docks)
- i. Wal-Mart west drive with S. Duff Ave. (right-in/right-out)
- j. Boston Commons drive with S. Duff Ave.
- k. Tuffy's drive with S. Duff Ave.

Data sources such as turning movement, trip generation, and crash history were used in order to answer the following questions posed during the study: 1) Is a traffic signal warranted? 2) If so, where is the most safe, efficient, and practical location for a new signalized intersection? 3) In order to ensure ongoing operations of the signal, what other access management improvements are required?

#### Warrant Analysis

As required by the Manual on Uniform Traffic Control Devices (MUTCD), which sets the federal standards for all traffic control devices, a traffic signal shall only be installed if an engineering study finds that at least one (or more) of nine possible warrants as specified in the MUTCD are met. For the purpose of this study, staff analyzed the three main warrants numbers 1 to 3 as follows:

- Warrant 1: Eight-Hour Vehicular Volume
- Warrant 2: Four-Hour Vehicle Volume
- Warrant 3: Peak-Hour Volume

# The analysis of the traffic volume data was found to meet all three vehicle volume warrants. A summary of this data is shown in Attachment 2 of this report.

#### Location of a New Traffic Signal

There were three main criteria used in selecting the appropriate location for a new traffic signal along S. Duff Avenue: 1) For traffic progression/coordination, signal spacing should be between one-eighth and one-quarter mile spacing; 2) Based on traffic an operational analysis, the required queue distances between S. 5<sup>th</sup> Street and the new traffic signal should be identified so that traffic does not block either intersection; and 3) Based on existing development, locations should be identified that have the greatest potential for internal circulation between sites.

The first criterion specifies intersection spacing between one-eighth and one-quarter mile, which ranges from 660 to 1,320 feet. The current Wal-Mart drive is spaced approximately 550 feet south of S. 5<sup>th</sup> Street. **Therefore, a new traffic signal at a minimum would need to be located further south than the existing Wal-Mart drive onto S. Duff Avenue.** 

The second criterion, queuing distance, showed that a new signalized intersection placed approximately at the 660 foot spacing would yield maximum northbound/southbound queues between 220 to 320 feet during the peak hours. Since this number is less than the minimum spacing under Criteria 1, the 660 foot remains the minimum spacing required.

The third criterion, internal site circulation, yields only two practical locations. These locations are the existing entrance to Boston Commons (915 ft spacing), or at the

southern drive aisle of Wal-Mart's parking lot frontage on S. Duff Avenue (725 ft spacing). **Based upon the study, the preferred location was found to be the connection into Wal-Mart's parking lot area.** This recommendation is based upon the results of the traffic operational analysis. That being said, this location is also more centrally located within the developable property along the S. Duff corridor between S. 5<sup>th</sup> Street and Squaw Creek.

#### Access Management/Safety Improvements

On November 25, 2013, City staff discussed the preliminary findings of this study with lowa DOT staff. Inasmuch as S. Duff Avenue is also U.S. Hwy 69, this corridor is under jurisdiction of the state. In general, Iowa DOT staff supported the findings of the warrant analysis and the proposed location of a new traffic signal at approximately 725 south of the S. 5<sup>th</sup> Street intersection.

In addition to the installation of a traffic signal, the proposed project would include restoration of street right-of-way in the area of the existing Wal-Mart drive, as well as some minor reconfiguration of Wal-Mart's parking lot and drive isles to accommodate the new traffic patterns. It should be noted that other than the existing Wal-Mart drive onto S. Duff Avenue, no other access closures are being proposed to those properties that are currently in use. If this project moves forward, all sites that are ready for redevelopment will have design for internal site circulation and access to the new traffic signal.

City staff also conducted a 10-year accident history using the statewide accident database for the segment of the S. Duff corridor between S. 5<sup>th</sup> Street and the Squaw Creek Bridge. The most current data (2003-2012) showed that in this 0.25 mile segment there were 103 accidents for that 10-year period, of which 29 resulted in someone being injured (see Attachment 3). A relevant comparison to similar roads within the State is provided below:

	Statewide Average (Principal Arterial)	South Duff Avenue	% Over Iowa Average		
All Crash Rates	283	419	148%		
Injury Crash Rates	76	118	155%		

As is shown above, this road segment has a significantly higher crash potential than what is expected of similar roadways. Due to these findings, this project includes the installation of a raised median between the S. 5<sup>th</sup> Street intersection and the new traffic signal location, and from the new signal south to the Squaw Creek Bridge. A conceptual layout has been provided under Attachment 4 at the end of this report.

Staff also conducted a benefit/cost calculation to quantify the safety value of the proposed improvements, including both a new traffic signal and a raised median. The project would be expected to have a B/C ratio of at least 3.3:1, which is significantly

higher that what is typically seen for a roadway improvement due to the relatively low cost of the improvement itself. This ratio is determined using the estimated savings from the reduction in crashes based on a 20-year service life, and is valued at approximately \$1,077,500 (see Attachment 5).

#### Estimated Project Cost and Funding Strategy

The anticipated cost for this project includes \$200,000 for a new traffic signal, plus approximately \$125,000 in roadway and paving improvements, bringing the total estimated cost to \$325,000. This project would be eligible for lowa DOT grant funding from the Urban-State Traffic Engineering Program (U-STEP), which allows up to a maximum amount of \$400,000 for linear improvements. The grant funding requires a local match of 45%. This breaks out as follows:

	Iowa DOT U-STEP (55%)	Local Match (45%)
Traffic Signal (\$200k)	\$110,000	\$90,000
Roadway/Paving (\$125k)	\$68,750	\$56,250
Totals	\$178,750	\$146,250

Individual meeting invitations to discuss the findings of this study were sent to all affected property owners along S. Duff Avenue between S. 5<sup>th</sup> Street and Squaw Creek. A description of a method to split approximately \$150,000 in local match amongst the stakeholders was also distributed. The meeting was held on the evening of December 3, 2013 in the City Council Chambers.

During the meeting with the property owners, staff explained the reasoning for the location of the new intersection and the safety benefits of installing a raised median along S. Duff Avenue. Much of the discussion focused on issues related to the raised median. Topics that caused the greatest concern are as follows:

- Negative financial impact on businesses/Convenience factor (raised median)
- Longer trips caused by a raised median (U-turns)
- Willingness of property owners to provide cross-access easements
- Special need for access of larger vehicles (semi-trucks, heavy-equipment)

Staff recognizes that a raised median could be impactful on those businesses that currently have direct access onto S. Duff Avenue. However, the median will be necessary for the improvement of safety and for the efficient progression of traffic between the two intersections. It should be noted that the longer-term success of this project will involve an internal site circulation plan between properties to guide the design/layout of future development within this corridor.

#### STAFF COMMENTS:

The South Duff Avenue commercial corridor for many years has experienced challenges related to access management and traffic safety. With several properties becoming vacant and/or are being considered for redevelopment, an opportunity now exists to apply current best traffic management practices to reduce conflict points along S. Duff Avenue. This project presents an opportunity to make a significant traffic improvement in the South Duff corridor that will have mutual benefit for both adjacent businesses and the greater Ames community alike.

There are existing Iowa DOT access agreements for driveways at 519 S. Duff (No. 85-2012-001, Bundy Family Trust) and 534 S. Duff (No. 85-2007-001, Wal-Mart) that both have similar conditions that may require the installation of a raised median, and/or full closure of the respective drives. The conditions of those actions are driven by safety or traffic issues that occur from direct access to S. Duff Avenue, as determined by the City or the Iowa DOT.

Staff believes that a fair approach to financing this project would be for the City to contribute up to \$50,000 towards the local match for these improvements. In addition, Wal-Mart, Hunizker Development and the Bundy Family Trust could be approached to contribute the remaining two-thirds (\$100,000).

If City Council is supportive of this proposed traffic signal and access management project, direction could be given to staff to pursue proceed through the following sequential steps:

- 1. Negotiate development agreements with the neighboring property owners that will secure \$100,000 in funding commitments.
- 2. Identify the City's source of funding (\$50,000) for the project.
- 3. Submit a grant application to the lowa DOT for U-STEP funds.
- 4. Secure cross-access easements to support the goal of the project.
- 5. Select an engineering consultant to design the project.
- 6. Construct the project.

However, before providing this direction, it should be emphasized that in order improve safety and accommodate the growing development needs along the corridor, the appropriate solution to this traffic situation requires the installation of <u>both</u> a traffic signal and a raised median. The Council must understand that not every property/business owner is in support of the proposed solution (raised median).



#### Attachment 1: Existing PM Peak Turning Movement Counts

#### **Attachment 2: Warrant Data Summary**

Haur	Maior Street	Minor	Minor Street		lition
Hour	Major Street	EB	WB*	Α	В
11:00:00 AM	2,009	143	416	8	(
12:00:00 PM	2,292	163	491	(	(
1:00:00 PM	2,171	154	446	8	$\mathbf{r}$
2:00:00 PM	1,901	135	422		$\mathbf{r}$
3:00:00 PM	1,868	133	385	Ŋ	$\mathbf{b}$
4:00:00 PM	2,213	157	441	Ŋ	$\mathbf{b}$
5:00:00 PM	2,490	177	500	$\mathbf{v}$	$\mathbb{Y}$
6:00:00 PM	2,121	151	453	Ŋ	$\mathbb{Y}$
7:00:00 PM	1,934	137	422	Ŋ	$\mathbf{b}$
	Th	rocholder	Major	600	900
	111	162110102.	Minor	200	100

## Warrant 1: Eight-Hour Vehicular Volume

\*WB volume is a sum of actual traffic counts from the existing Wal-Mart drive and Trip Generation estimation for the undeveloped area that is anticipated to be a fast food restaurant.

# Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume Condition AMinimum Vehicular Volume

Number of lar traffic on ea	nes for moving ch approach	Vehicle (tot	es per hou al of both	ir on majo approach	r street les)	Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100% <sup>a</sup> 80% <sup>b</sup> 70% <sup>c</sup> 56% <sup>d</sup>				100%ª	80% <sup>b</sup>	70%°	56% <sup>d</sup>
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition	BInterruption	of Continuous	Traffic

Number of lar traffic on ea	nes for moving ch approach	Vehicle (tot	es per hou al of both	ir on majo approach	r street les)	Vehicles per hour on higher-volume minor-street approach (one direction only)				
Major Street	Minor Street	100% <sup>a</sup> 80% <sup>b</sup> 70% <sup>c</sup> 56% <sup>d</sup>				100%ª	80% <sup>b</sup>	70%°	56% <sup>d</sup>	
1	1	750	600	525	420	75	60	53	42	
2 or more	1	900	720	630	504	75	60	53	42	
2 or more	2 or more	900	720	630	504	100	80	70	56	
1	2 or more	750	600	525	420	100	80	70	56	





lowa Department of Transportation		Major Cause Sul S Duff Access Stud	mmary	,	
Analysis Years: 2003 [9],	2004 [9], 20	05 [11], 2006 [5], 2007 [7], 2008 [12]	, 2009 [17], 2	Report V	rsion 1.1 Jan 2005
Crash Summary:		Injury Summary:		Surface Condition Summa	ry:
Fatal	_	Fatal	_	Dry	75
Maior Injury	_	Major Injury	-	Wet	21
Minor Injury	14	Minor Injury	16	lce	2
Possible/Unknown	15	Possible	21	Snow	1
PDO	74	Unknown	1	Slush	3
Total Crashes	103	Total Injuries	38	Sand/Dirt/Oil/Gravel	-
				Water	-
				Other	-
TOT Bron	orty Dam	aa. \$511 287		Unknown	1
		age. 3044,207		Not Reported	-
AVG Prop	erty Dam	age: \$5,284		Total Crashes	103
Major Cause Summary:					
2 Animal			Improper E	Backing	
Ran Traffic Signal			Illegally Pa	irked/Unattended	
Ran Stop Sign		3	Swerving/E	Evasive Action	

#### Attachment 3: Crash History (2003-2012)

		Over-Correcting/Over-Steering
Intersection		Downhill Runaway
ırn on Red Signal	1	Equipment Failure
		Separation of Units
I		Ran Off Road - Right
n		Ran Off Road - Straight
		Ran Off Road - Left
sition		Lost Control
		Inattentive/Distracted By: Passenger
n narrative)	1	Inattentive/Distracted By: Use of Phone or Other
n Wrong Side of Rd		Inattentive/Distracted By: Fallen Object
itions		Inattentive/Distracted By: Fatigued/Asleep
ed		Other: Vision Obstructed
		Oversized Load/ Oversized Vehicle
		Cargo/Equipment Loss or Shift
	20	Other: Other Improper Action
al	4	Unknown
I	2	Other: No Improper Action
less/Aggressive Manner	1	None Indicated
Notoc: 2002 2012 Cm		
	Intersection Irrn on Red Signal n sition n narrative) n Wrong Side of Rd itions ed al less/Aggressive Manner	Intersection Irrn on Red Signal 1 In sition In narrative) 1 In Wrong Side of Rd itions ed 20 al 20 al 20 less/Aggressive Manner 1

12/3/2013

Crash Mapping Analysis Tool

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Driver and Time Summary S Duff Access Study

Report Version 1.0 Aug 2006

Crash Time of Day Summary:

From	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00			
То	01:59	03:59	05:59	07:59	09:59	11:59	13:59	15:59	17:59	19:59	21:59	23:59	NR	Total	%
SUN	-	-	-	-	-	-	2	1	1	-	-	1	-	5	5
MON	-	-	-	-	-	-	4	2	1	1	-	-	-	8	8
TUE	-	-	-	-	1	2	3	3	1	1	2	-	-	13	13
WED	-	-	-	-	1	1	4	4	3	1	-	-	-	14	14
THU	-	_	-	-	1	1	6	1	5	1	1	-	-	16	16
FRI	-	_	-	-	_	2	10	1	4	4	-	1	-	22	21
SAT	-	-	-	-	1	3	8	4	4	3	2	-	-	25	24
Tot.					4	9	37	16	19	11	5	2		103	
%					4	9	36	16	18	11	5	2			100

Driver Age/0	Gender	Summary:				Drug/Alcohol Summary:		
Age	Male	Female	NR	Drivers	%		Total	%
<14	-	-	-			Drug		
14	-	-	-			Alcohol, Less than Statutory		
15	-	-	-			Alcohol, Statutory	1	1
16	4	2	-	6	3	Drug/Alcohol, Less than Statutory		
17	1	3	-	4	2	Drug/Alcohol, Statutory		
18	3	3	-	6	3	Refused		
19	2	4	-	6	3	Under Influence of Alc/Drugs/Meds		
20	6	5	-	11	5	None Indicated	102	99
21 to 24	16	22	-	38	17	Total Crashes	103	100
25 to 29	25	14	-	39	18			
30 to 34	8	9	-	17	8	Fixed Object Struck Summary:		
35 to 39	9	6	1	16	7		Vehs.	%
40 to 44	9	3	-	12	5	Bridge/Bridge rail/Overpass		
45 to 49	6	7	-	13	6	Underpass/Structure Support		
50 to 54	11	3	1	15	7	Culvert		
55 to 59	12	5	-	17	8	Ditch/Embankment		
60 to 64	6	4	-	10	5	Curb/Island/Raised Median	1	0
65 to 69	3	1	-	4	2	Guardrail		
70 to 74	3	-	-	3	1	Concrete Barrier		
75 to 79	2	-	-	2	1	Tree		
80 to 84	-	-	-			Pole - Utility/Light/Etc		
85 to 89	-	-	-			Sign Post		
90 to 94	1	-	-	1	0	Mailbox		
95 plus	-	-	-			Impact Attenuator		
NR	-	-	2	2	1	Other Fixed Object		
Drivers	127	91	4	222		None	221	100
%	57	41	2		100	Total Vehicles	222	100

Selection Filter:

None

Notes: 2003-2012 Crash Years

12/3/2013

Analyst: DNP

**Crash Mapping Analysis Tool** 

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### Attachment 4: Conceptual Project Layout

### Attachment 5: Benefit/Cost Estimation:

	Road	l Segr	nent Bene	efit /	Cost Safe	ty Analys	is	Kev
		lov	va DOT Offic	ce of	Traffic & Sa	fety		
County:	Story		Prepa	red by	: D	NP	Date Prepared:	Dec 1, 2013
Location:	US 69 - 3	S 5th Str	eet to Squaw C	reek B	ridge			
provement								
Proposed Im	provement	(s):	South Duff Acc	cess M	anagement and	d Traffic Signal		
r topoood int		.(0).	oodin Dail / loc				j.	1
¢ 225.000	Fatimate		amant Coat <b>F</b>	· · · · ·		20	Fat Improveme	ntlife veen V
\$ 325,000					•	20		Finit Life, years, T
<b>\$</b> -	Other An	inual Cos	st (after initial ye	ear), A		39	Crash Reductio	n Factor (Integer), C
\$ -	Present	Value Ot	her Annual Cos	ts, <b>OC</b>		4.0%	Discount Rate,	INT
	$OC = \frac{AC}{Dr}$	1	1			\$ 325,000	Present Value A	All Costs,
	IIV	/ (	+ INT <b>j</b> )				COST = EC + C	
affic Volum	e Data							
Source:	lowa DO	Ţ	-	,			2011	Date of traffic coun
	Two-way							
Length (mi.)	veh/day	Descript	ion			6,750	Current Vehicle	Miles / Day, VM
0.25	27,000					8,236	End of Life Veh.	. Miles / Day
						2,463,750	Current Veh. Mi	les / Year, AM
						54,249,321	Total Projected	Veh. Miles Over
							Life of Proje	ct, <b>TVMT</b>
0.25	miles tot	al						$(1, C)^{\gamma}$
							$TVMT = \frac{AM}{M}$	$1 - \left(\frac{1+6}{-1}\right)$
1.0%	Projected	d Traffic (	Growth (0%-10%	6), <b>G</b>			-G	
ash Data								
2003	First full	vear>	2012	Last fu	ull vear	10.0	vears. Time Pe	riod. <b>T</b>
0	Additiona	al months	2			val	ues as of Dec. 2	007
0	Eatal Cra		, 	0	Estalition @	<u>va</u>	\$2 500 000	¢
0				0		-	\$3,500,000	φ -
				0	Major Injuries	@	\$240,000	\$ -
29	Injury Cra	ashes -	<b>→</b>	16	Minor Injuries	@	\$48,000	\$ 768,000
				22	Possible Injur	ies @	\$25,000	\$ 550,000
74	Property	Damage	Only		(assumed	cost per crash)	\$2,700	\$-
					-OR- enter a	I Property Cost	ts of all crashes:	\$ 544,287
103	Total Cra	shes, <b>T</b> A	4			Tota	al \$ Loss, <b>LOSS</b>	\$ 1,862,287
	0			( <del>-</del>			o	
10.30	Current C	Crashes /	Year, $AA = IA$	( / I		418.1	Crashes / HMV	M, Crash Rate, CR
	Cost per		$\mathbf{AVCR} = LUSS / \mathbf{E}$			A 077 101	$CR = IA \times 10$	איט (AMIXI)
226.8	Total Exp		rasnes, ICR =	CRXI	VM1/10/8	\$ 1,077,461	Present Value of	of Avoided
4.03	Crashes	Avoided	First Year AAR	= AA	x CRF / 100		Crashes, <b>BE</b>	
	Crash Co	osts Avoi	aed in First Yea	ar, AAF		DEN	$AVCR \times AAR$	$\begin{pmatrix} 1+G \end{pmatrix}^{Y}$
\$ 72,946	Lotal Ave	olded Cra	snes, TCR x Cl	≺⊦/ 10	U	BEN. = -	(NT-G)	$1 - \left( \frac{1}{1 + INT} \right)$
\$ 72,946 88.8	Total Ave							
\$ 72,946 88.8	Ratio							,
\$ 72,946 88.8 nefit / Cost	t Ratio							