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28 West Street North

FUNCTIONAL SERVICING REPORT

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Issue	Date	Description
1	September 8, 2021	Final report
2	April 6, 2022	Final Report (Revised Fixture Count)

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1 Introduction

Tatham Engineering Limited has been retained by Diana & Carlo Corsi c/o Joshua Morgan, RPP, Morgan Planning & Development to prepare a Functional Servicing Report for the proposed redevelopment at 28 West Street North in the City of Orillia, Ontario.

The proposed redevelopment involves the renovation of the existing building to three 1-bedroom apartments, two 2-bedroom apartment, and one laundromat with ten washer/dryer units and a washroom.

1.1 EXISTING SITE CONDITIONS

28 West Street North is located on east side of West Street North and approximately 40 metres south of Coldwater Street East. A key plan illustrating the location of the property within the City of Orillia is shown in Figure 1, below.

Figure 1: Key Plan



The property currently operates as three rental units (two 1-bedroom and one 2-bedroom apartments) and office rental space. The neighbouring properties at the north, south and east side of the site are all developed. The site is accessed by the existing private driveway onto West Street North and parking space is shared with the property to the north.

1.2 BACKGROUND INFORMATION REVIEW

Several guidelines, background reports and studies relating to municipal services development in the area were utilized in preparation of this report as follows:

- City of Orillia, Wastewater System Master Plan (2013);
- City of Orillia, Water System Master Plan (R.V. Anderson, 2015);
- City of Orillia, West Street North As-Built Drawing W3-6 (1983);
- City of Orillia, Service Record Sheet, 28 West Street North (December 2020); and
- City of Orillia, Hydrant Flow Test Data (October 2020).



2 Existing Site Servicing

The site is currently serviced with municipal sanitary sewer and water. The size of the sanitary service could not be confirmed from the available information but is assumed to be a minimum of 100mm diameter pipe. The existing sanitary sewer main on West Street North is a 250 mm diameter sewer at 2.6% slope.

The existing water service is a 19 mm copper pipe connected to a 300 mm diameter watermain on the east side of West Street North. The existing sanitary and water information are determined from as-built information obtained from the City of Orillia. The fire hydrant closest to site is located approximately 35m north of the site on the southeast corner of the intersection of West Street North and Coldwater Road East.

The site currently has natural gas, hydro, and telecommunication services as it operates as three rental units and office rental space.



3 Proposed Redevelopment

The proposed redevelopment involves the conversion of the existing building to three 1-bedroom and two 2-bedroom apartments and one laundromat with ten washer / dryer units and a washroom. The existing building structure will remain and be renovated to support the redevelopment.

This report is focused on the sanitary and water service due to the increased demand from the change in use, primarily the addition of a laundromat.

3.1 SITE ACCESS

Site access will be maintained in its current configuration using the existing private driveway and parking space shared with the property to the north (40 West Street North).

3.2 SANITARY SERVICING

To determine the expected sanitary flow from the proposed redevelopment, two methods have been used to estimate the sanitary flows. The first method utilizes the Ontario Building Code (OBC) to determine flow based on a fixture count, and the other method is according to the City of Orillia Engineering Design Criteria Manual using a per capital/day flow rate.

3.2.1 Sanitary Flow per OBC

Using the OBC, the design flow is calculated by assigning fixture units and hydraulic loads to the flow generating fixtures. The fixture unit count used in the calculation is based on available information for the proposed development as summarized in Table 1 below:



Table 1: OBC Fixture Unit Summary

FIXTURE TYPE	HYDRAULIC LOAD	1-BEDROOM UNIT	2-BEDROOM UNIT	LAUNDROMAT
Bathroom (3-Piece)	6	6 (1)	6 (1)	-
Bathroom (2-Piece)	4	-	-	5.5 (1)
Kitchen Sink	1.5	1.5 (1)	1.5 (1)	-
Washing Machine	2	0 (0)		2 (10)
Total Hydraulic Load (per unit)		7.5	7.5	25.5
Number of Units		3	2	1
Total Hydraulic Load		22.5	15	25.5

The total hydraulic load based on a fixture count is 63. Utilizing OBC Table 7.4.10.5 the fixture count conversion to flow is 44.9 gpm. Accordingly the calculated flow is 2.8 L/s. A detailed summary of the calculations is included in Appendix A.

3.2.2 Sanitary Flow per Orillia Engineering Design Criteria Manual

Using the City of Orillia Engineering Design Criteria Manual, the design flow is calculated by assigning a per capita flow rate (300 L/c/day) to the rental units combined with a typical flow rate for laundromat's based on the OBC.

Table 2: Residential Units Design Flow Summary

UNIT TYPE	#OF UNITS	PERSON/UNIT	POPULATION	DESIGN FLOW (L/DAY)
1-Bedroom	3	2.95	8.85	2,655
2-Bedroom	2	2.95	5.9	1,770
Total			14.8	4,425

The resulting peak design flow for the residential units after application of peaking factors is 0.14 L/s. It is noted the City of Orillia Design Criteria Manual does not include a specific flow rate for Laundromat applications. Accordingly, specific flows have been calculated based on a typical commercial grade washing machine.



Table 3: Laundromat Design Flow Summary

FIXTURE	FLOW/UNIT	# OF UNITS	DESIGN FLOW (L/DAY)
Commercial Washer	2,500	10	25,000

The resulting peak design flow for the laundromat after application of peaking factors is 0.48 L/s. The combined peak flow rate is 0.62 L/s. A detailed summary of the calculations is included in Appendix A.

3.2.3 Design Sanitary Flow

Based on the two results from above, the design sanitary flow for the proposed site redevelopment is determined to be 2.8 L/s as calculated by the OBC fixture method. This flow rate is more conservative and will be utilized for design purposes.

3.2.4 Existing Sanitary Flow

For comparison the existing sanitary flows have been estimated using the OBC fixture count method.

Table 4: OBC Fixture Unit Summary

FIXTURE TYPE	HYDRAULIC LOAD	RENTAL UNIT	OFFICE
Bathroom (3-Piece)	6	6 (1)	-
Bathroom (2-Piece)	5.5	5.5 (0)	5.5 (1)
Kitchen Sink	1.5	1.5 (1)	1.5 (1)
Dishwasher	1	-	-
Washing Machine	2	-	-
Total Hydraulic Load (per unit)		7.5	7.0
Number of Units		3	1
Total Hydraulic Load		22.5	7



The total hydraulic load based on a fixture count is 29.5. Utilizing OBC Table 7.4.10.5 the fixture count conversion to flow is 32.7 gpm. Accordingly the calculated flow is 2.1 L/s. A detailed summary of the calculations is included in Appendix A.

3.2.5 Sanitary Service Capacity

The size of the existing sanitary service is unknown. Based on the available as-built information the existing sanitary sewer at the site service connection point is 3.6 m below road centre line. The length of the sanitary service from the sanitary sewer to the building is approximately 13.2 m. The resulting pipe slope is greater than 2%.

The minimum pipe size allowed for a residential development is 100 mm at 1% slope which has a corresponding flow capacity of 5.2 L/s based on Manning's formula. The existing sanitary service is therefore considered to have sufficient capacity to support the proposed design flow.

3.2.6 Downstream Sanitary Sewer Capacity

The existing sanitary sewer on West Street North the site sanitary service connected to, is a 250 mm diameter sewer at 2.6% slope. The full flow capacity is 95.88 L/s based on Manning's formula in conformance with Orillia Design Criteria Manual. The design sanitary flow of 2.8 L/s represents approximately 2.9% of the existing sanitary sewer capacity. The increased sanitary flow from site redevelopment (0.7 L/s) is marginal compared to the sanitary sewer capacity. The existing sanitary sewer is determined to have sufficient capacity for the proposed site redevelopment.

3.3 WATER SERVICE

Similar to determining the design sanitary flow, the water demand for the proposed site redevelopment is calculated with two methods described in the previous section.

3.3.1 Water Demand per OBC

Using the OBC, the design flow is calculated by assigning fixture units and hydraulic loads to the flow generating fixtures. The fixture unit count used in the calculation is based on available information for the proposed development as summarized in Table 5 below:



Table 5: OBC Fixture Unit Summary

FIXTURE TYPE	HYDRAULIC LOAD	1-BEDROOM UNIT	2-BEDROOM UNIT	LAUNDROMAT
Bathroom (3-Piece)	3.6	3.6 (1)	3.6 (1)	-
Bathroom (2-Piece)	3.2	-	-	3.2 (1)
Kitchen Sink	1.4	1.4 (1)	1.4 (1)	-
Washing Machine	4	0 (0)	0 (0)	4 (10)
Total Hydraulic Load (per unit)		5.0	5.0	43.2
Number of Units		3	2	1
Total Hydraulic Load		15	10	43.2

The total hydraulic load based on a fixture count is 68.2. Utilizing OBC Table 7.4.10.5 the fixture count conversion to flow is 46.5 gpm. Accordingly the calculated flow is 2.9 L/s. A detailed summary of the calculations is included in Appendix A.

3.3.2 Water Demand per Orillia Engineering Design Criteria Manual

Using the City of Orillia Engineering Design Criteria Manual, the design flow is calculated by assigning a per capita flow rate (350 L/c/day) to the rental units combined with a typical flow rate for laundromat's based on the OBC.

Table 6: Residential Units Design Flow Summary

UNIT TYPE	#OF UNITS	PERSON/UNIT	POPULATION	DESIGN FLOW (L/DAY)
1-Bedroom	3	2.95	8.85	2,065
2-Bedroom	2	2.95	5.9	3,098
Total			14.75	5,163



Table 7: Laundromat Design Flow Summary

FIXTURE	FLOW/UNIT (L/DAY)	# OF UNITS	DESIGN FLOW (L/DAY)
Commercial Washer	2,500	10	25,000

The resulting maximum day, and peak hour design flows for the development after application of peaking factors is 0.6 L/s, and 1.6 L/s respectively. A detailed summary of the calculations is included in Appendix B.

3.3.3 Water Demand per Washing Machine Manufacturer's Specifications

Water demand is calculated based on proposed apartment unit and the washing machine considered to be used for the laundromat.

For the apartment units, the design flow is calculated using the City of Orillia Engineering Design Criteria Manual(350 L/c/day).

Table 8: Residential Units Design Flow Summary

UNIT TYPE	#OF UNITS	PERSON/UNIT	POPULATION	DESIGN FLOW (L/DAY)
1-Bedroom	3	2.95	8.85	2,065
2-Bedroom	2	2.95	5.9	3,098
Total			14.75	5,163

The resulting maximum day, and peak hour design flows for the apartment unit after application of peaking factors is 0.1 L/s, and 0.3 L/s respectively.

For the laundromat, with the considered Maytag washing machine, the specified water usage is 125 L/Cycle. For the purpose of estimating peak flows we have assumed a worst case scenario where of all the machines are running a cycle simultaneously. An average cycle is 30 minutes with an initial peak to fill the washer and a second peak during the rinse phase. We have assumed both of the fills take 5 minutes resulting in a peak flow of 0.21 L/s (62.5L/5 mins/machine).

Table 9: Laundromat Design Flow Summary

WASHING MACHINE	PEAK FLOW/UNIT (L/S)	# OF UNITS	DESIGN FLOW (L/S)
Maytag	0.21	10	2.1



The combined peak flow from the apartment units and laundromat is $2.1+0.3=2.4$ L/s.

3.3.4 Design Water Demand

Based on the three results from above, the design water demand for the proposed site redevelopment is determined to be 2.9 L/s as calculated by the OBC fixture method. This flow rate is more conservative and will be utilized for design purposes.

3.3.5 Existing Water Demands

For comparison the existing water demands have been estimated using the OBC fixture count method.

Table 10: OBC Fixture Unit Summary

FIXTURE TYPE	HYDRAULIC LOAD	RENTAL UNIT	OFFICE
Bathroom (3-Piece)	3.6	3.6 (1)	-
Bathroom (2-Piece)	3.2	-	3.2 (1)
Kitchen Sink	1.4	1.4 (1)	1.4 (1)
Total Hydraulic Load (per unit)		5	4.6
Number of Units		3	1
Total Hydraulic Load		15	4.6

The total hydraulic load based on a fixture count is 19.6. Utilizing OBC Table 7.4.10.5 the fixture count conversion to flow is 26.8 gpm. Accordingly the calculated flow is 1.7 L/s. A detailed summary of the calculations is included in Appendix A.

3.3.6 Water Service Size

The site is currently serviced with a 19 mm diameter copper pipe connected to a 300 mm diameter watermain on east side of West Street North. The distance from the watermain to the building is approximately 8.5 m.

Using the Hazen-Williams Formula, the existing 19 mm diameter water service is determined to be under sized for the site redevelopment as the anticipated peak flow cannot be provided through a 19 mm diameter service.

The water service needs to be upgraded to a 50 mm diameter water service. Detailed sizing calculations are included in Appendix C.



3.3.7 Existing Watermain Capacity

To determine capacity in the existing water system hydrant flow test results were requested from the City. Fire Hydrant #133 is located at southeast corner of West Street North and Coldwater Street East intersection and is the closest to the site however it is not connected to the same watermain that provides service to the subject property.

Fire Hydrants 805 and 120 are connected to the 300 mm watermain on West Street. Based on latest hydrant flow test data from 2020, the static pressure of hydrant 805 was 58 psi, and hydrant 120 was 72 psi. Hydrant 805 recorded a flow rate of 67.3 L/s (1067 US gal/min) with residual pressure of 40 psi. Hydrant 120 recorded a flow rate of 85.2 L/s (1350 US gal/min) with residual pressure of 64 psi.

While both hydrant test results indicate there to be sufficient capacity, the site service connection point is closer to hydrant 120 than to hydrant 805. The existing 300 mm diameter watermain is therefore determined to have sufficient capacity to provide the peak hour water demand of 2.9 L/s for the site redevelopment when considered with a new 50 mm water service.

3.4 STORMWATER MANAGEMENT

As the proposed redevelopment is a renovation project and the existing building will remain, no changes to site topography or drainage patterns are expected. Accordingly implementation of stormwater management strategies are not required.

3.5 UTILITIES

The site currently has gas, hydro, etc. services as it operates as three rental units and office rental space. Being located at downtown area of Orillia, the existing utility services are expected to have available capacity to support the site redevelopment.



4 Summary

In summary, the findings of this FSR are:

1. The design sanitary flow rate is 2.8 L/s. The existing sanitary service and existing sanitary sewer on West Street North will have sufficient capacity to support the proposed development.
2. The design water demand is 2.9 L/s. The existing 19 mm diameter water service does not have sufficient capacity to support the proposed development. A minimum 50 mm diameter service connected to the existing 300 mm diameter watermain will be required to support the development.
3. Storm water management measures will not be required.
4. Existing utilities (Gas, Hydro, and Telecommunications) are expected to provide sufficient service.



Appendix A: Sanitary Flow Calculation



PROJECT	28 West Street North	FILE	320916
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SUBJECT	Sanitary Flow	NAME	WL
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Sanitary Flow Calculation Using Hydraulic load per OBC Table 7.4.9.3:

2-2 bedroom units: 15 Fixture Units

Fixture	Hydraulic Load
Bathroom group(3 piece)	6
Kitchen Sink	1.5
Total Each Unit:	7.5

3-1 bedroom units: 22.5 Fixture Units

Fixture	Hydraulic Load
Bathroom group(3 piece)	6
Kitchen Sink	1.5
Total Each Unit:	7.5

Laundromat: 25.5 Fixture Units

Fixture	Hydraulic Load
Washer - 10	2
Washroom group(2 piece)	5.5

Total Hydraulic Load: 63 Fixture Units

Using OBC Table 7.4.10.5 to transfer Fixture Units Load to GPM:

63 Fixture Units Load = 44.9 GPM = 2.8 l/s - Maximum Probable Flow Rate

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Sanitary Flow Calculation per Orillia Design Criteria Manual:

Residential Sanitary Design Flow per Orillia Design Criteria Manual: (300l/c/d)

Unit Type	Unit Quantity	Person/Unit	Population	Design Flow (l)
2 bedroom Apartment	2	2.95	5.9	1770
1 bedroom Apartment	3	2.95	8.85	2655
Total Residential:			14.8	4425
				0.05 l/s

Peaking Factor per Orillia Design Criteria Manual:

M= 2.8

Peak Residential Flow: 0.14 l/s

Landromat with 10 Washer Per OBC Table 8.2.1.3.A, each washer at 2500l/d 10 Washer Flow: 25000 l/d
0.29 l/s

Landromat Washroom group using 28 m³/ha/day rate (0.03 ha area) 0.01 l/s

Total Landromat flow: 0.30 l/s

Peaking Factor per Orillia Design Criteria Manual (Commercial): 1.60

Peak Landromat Flow: 0.48 l/s

Infiltration Flow per Orillia Design Criteria Manual: (rate of 0.10l/s/ha)

Site Area (ha): 0.03

Infiltration Flow: 0.003 l/s

Total Sanitary Peak Flow: 0.62 l/s

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Existing Sanitary Flow Calculation Using Hydraulic load per OBC Table 7.4.9.3:

3 - Rental Units:	22.5	Fixture Units
Fixture		Hydraulic Load
Bathroom group(3 piece)		6
Kitchen Sink		1.5
Total Each Unit:		7.5

1 - Rental Office Unit:	7	Fixture Units
Fixture		Hydraulic Load
Bathroom group(2 piece)		5.5
Kitchen Sink		1.5
Total Hydraulic Load:	7	Fixture Units

Total Hydraulic Load: 29.5 Fixture Units

Using OBC Table 7.4.10.5 to transfer Fixture Units Load to GPM:

29.5 Fixture Units Load = 32.7 GPM = 2.1 l/s - Maximum Probable Flow Rate

Appendix B: Water Demand Calculation

PROJECT	28 West Street North	FILE	320916
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SUBJECT	Water Demand	NAME	WL
		PAGE	1 OF 1

Water Demand Calculation Using Hydraulic Load per OBC 7.6.3.2:

2-2 bedroom units:	10	Fixture Units
		Hydraulic Load
Bathroom group(3 piece)		3.6
Kitchen Sink		1.4
Total Each Unit:		5

3-1 bedroom units:	15	Fixture Units
		Hydraulic Load
Bathroom group(3 pieces)		3.6
Kitchen Sink		1.4
Total Each Unit:		5

Laundromat:	43.2	Fixture Units
		Hydraulic Load
10 Washer (use 6.8kg for conservative)		4
Washroom group(2 piece)		3.2

Total Hydraulic Load: 68.2 Fixture Units

Using OBC Table 7.4.10.5 (conservative) to transfer Fixture Units Load to GPM:

$$68.2 \text{ Fixture Units Load} = 46.5 \text{ GPM} = 2.9 \text{ l/s}$$

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SUBJECT	Water Demand	NAME	WL
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Water Demand Calculation per Orillia Design Criteria Manual: (350l/c/d)

Unit Type	Unit Quantity	Person/Unit	Total Population	Water Demand (l)
2 bedroom Apartment	2	2.95	5.9	2065
1 bedroom Apartment	3	2.95	8.85	3098
Laundromat with 10 Washer Per OBC Table 8.2.1.3.A, each washer at 2500l/d				25000
Landromat Washroom group using 28 m ³ /ha/day rate (0.03 ha area)				840
Total Demand:				31003 l
Total Demand:				0.36 l/s

Peaking Factor per Orillia Design Criteria Manual:

Maximum Day Factor	1.6	Maximum Day Rate=	0.6 l/s
Peak Hour Factor	4.5	Peak Hour Rate=	1.6 l/s



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SUBJECT	Water Demand	NAME	WL
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Water Demand Calculation per Washing Machine Manufacturer's Specifications

Water Demand Calculation for Apartment per Orillia Design Criteria Manual: (350l/c/d)

Unit Type	Unit Quantity	Person/Unit	Total Population	Water Demand (l)
2 bedroom Apartment	2	2.95	5.9	2065
1 bedroom Apartment	3	2.95	8.85	3098
Total Demand for Apartment:				5163 l
Total Demand for Apartment:				0.06 l/s

Peaking Factor per Orillia Design Criteria Manual:

Maximum Day Factor	1.6	Maximum Day Rate=	0.10 l/s
Peak Hour Factor	4.5	Peak Hour Rate=	0.3 l/s

Water Demand Calculation for Laundromat per Washing Machine Manufacturer's Specifications:

Proposed Washing Machine with Water Rate of 125 l/cycle/10min (5mins fill, 5 mins rinse) = 12.5 l/min = 0.21 l/s
 10 Washing Machine Peak Water Demand is: 10x0.21= 2.1 l/s

Water Demand for Landromat Washroom per Orillia Design Criteria Manual: 28m3/ha/day rate (0.03 ha are: 0.01 l/s

Peak water demand for landromat washroom (using peak factor of 4): 0.04 l/s

Total Peak Water Demand Rate for Apartment Units and Laundromat is: 2.4 l/s

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SUBJECT	Water Demand	NAME	WL
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Existing Water Demand Calculation Using Hydraulic Load per OBC 7.6.3.2:

3 - Rental Units:	15	Fixture Units
Fixture		Hydraulic Load
Bathroom group(3 piece)		3.6
Kitchen Sink		1.4
Total Each Unit:		5

1 - Rental Office Unit:	4.6	Fixture Units
Fixture		Hydraulic Load
Bathroom group(2 piece)		3.2
Kitchen Sink		1.4
Total Rental Office Unit:		4.6

Total Hydraulic Load: 19.6 Fixture Units

Using OBC Table 7.4.10.5 (conservative) to transfer Fixture Units Load to GPM:

$$19.6 \text{ Fixture Units Load} = 26.8 \text{ GPM} = 1.7 \text{ l/s}$$

Appendix C: Water Service Sizing



PROJECT	28 West Street North	FILE	320916
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SUBJECT	Water Service Size	NAME	WL
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Water Demand Q: 2.9 l/s

Length of Water Service From Existing Watermain to Building: 8.5 m

Existing Water Service: 19 mm

Per Hazen-Williams Formula:

$$Q = 0.84918 * C * A * (R^{0.63}) * (S^{0.54})$$

where Q = Flow Rate (m³/sec.)

C = Coefficient of Roughness, use 100

A = Cross-Sectional Flow Area (m²)

R = Hydraulic Radius (m)

S = Slope of Energy Grade Line (m/m)

$$S = 10.2 \text{ (m/m)}$$

Potential Pressure Loss in Water Service From Existing Watermain to Building Due to Friction:

$$H = 123 \text{ psi}$$

It's obvious the existing 19 mm water service is undersized for the peak water demand of 2.9 l/s.

Proposed Water Service: 50 mm

$$S = 0.09 \text{ (m/m)}$$

Potential Pressure Loss in Water Service From Existing Watermain to Building Due to Friction:

$$H = 1.1 \text{ psi}$$

Flow Velocity in Water Service to Provide for Peak Demand of 2.9 l/s:

$$V = 1.5 \text{ m/s}$$

Existing Watermain Pressure at service connection: 65 psi

The two hydrants closest connected to the existing watermain that the water service connected to are Hydrants 805 and 120. Based on latest hydrant flow information obtained from City of Orillia, the static pressure of hydrant 805 is 58 psi, and hydrant 120 is 72 psi. The service connection point is closer to hydrant 120 than hydrant 805. Using the average pressure of hydrants 120 and 805, the watermain pressure at service connection is 65 psi.

A 50 mm water service is sufficient to provide for the peak demand of 2.9 l/s for the site re-development.