

**SENSITIVE HABITAT INVENTORY MAPPING
WETLAND INVENTORY MAPPING**

Completion Abstract

2013 Inventory and Mapping

Prepared for:

City of Salmon Arm
500 - 2 Avenue NE, Box 40
Salmon Arm, BC, V1E 4N2



Prepared by:

Forsite Consultants Ltd.
330 – 42nd Street SW
Salmon Arm, BC, V1E 4R1



August 2013

Table of Contents

Table of Contents	i
1. Introduction	2
1.1 Project Objectives.....	2
1.2 Study Area.....	2
2.0 2013 SHIM Summary	3
2.1 Salmon River Watershed (Streams: S1-S5, Mouttell and Rumball)	3
2.2 Turner Creek Watershed	3
2.3 Palmer Creek Watershed	4
2.4 Syphon Creek Watershed	4
2.5 Canoe Creek Watershed	4
2.6 Leonard/Hobson Watersheds.....	4
3. 2013 WIM Summary	4
3.1 Wetland Class and Proper Function Condition.....	4
3.2 Wetland Habitat Enhancement Opportunities and Management Considerations	6
4. Recommendations.....	6
Appendix 1 2013 SHIM Photo Documentation	Separate Cover
Appendix 2 2013 WIM Photo Documentation.....	Separate Cover
SHIM WIM 2013 Overview Index Map	Separate Cover

1. Introduction

Forsite Consultants (Forsite) was retained by the City of Salmon Arm to identify, describe and map sensitive stream and wetland habitat as part of their Official Community Plan's environmental management policy. In 2012, Forsite completed Phase 1 of the Sensitive Habitat Inventory Mapping (SHIM) and Wetland Inventory Mapping (WIM) project. This work involved portions of the following eight main stream systems within the Salmon Arm municipality: Canoe, Palmer, Leonard, Hobson, Syphon, Cress and Turner Creeks as well as the Salmon River. In addition, smaller stream, ditch systems and associated wetlands within the Salmon Arm municipal boundary were also inventoried. In 2012, approximately 69 km of streams and 71 wetlands were inventoried as part of the project.

In continuation of the 2012 inventory program, 2013 work (Phase 2 work) was focused on the following priorities:

1. Remaining stream sections of the Salmon River and associated tributaries.
2. Suspect stream off 17 Street SE.
3. Suspect stream near Okanagan Avenue and South Broadview.
4. Suspect stream along 40 Street NW.
5. Isolated stream segment near Salmon River and Shuswap Lake wetlands.
6. Small stream segment south of the Trans-Canada Highway, near intersection of highway and 10 Avenue SW.

The methodology and approach used is consistent with 2012 inventory work and is described in the 2012 *Sensitive Habitat Inventory and Mapping and Wetland Inventory Mapping for the City of Salmon Arm*, (Forsite, 2012). In total 24.9 km of stream and 48 wetlands were inventoried in 2013.

1.1 Project Objectives

The objectives of completing the SHIM and the WIM included, but were not limited to:

- Providing inventory information and mapping the extent of streams, wetlands, and associated riparian and fish habitat features;
- Providing digital data layers that can be easily incorporated into the City of Salmon Arm's geographical information system (GIS); and
- Providing information that will better support land-use management decisions and habitat enhancement opportunities.

1.2 Study Area

The study area was comprised of eight priority stream/watershed groupings established by the City of Salmon Arm in consultation with the Department of Fisheries and Oceans and the City's Environmental Advisory Committee. Criteria used were based on development pressures relative to sensitive habitat types such as fish streams, riparian vegetation, and wetland ecosystems. The list of priority streams are provided in Table 1 below.

2.0 2013 SHIM Summary

Table 1. 2013 SHIM Stream Lengths Inventoried

Stream/Watershed Group	Kilometres of Stream
Salmon River	1.94
Salmon River Residual Streams and Tributaries (S3-S8)	3.60
Rumball Creek	4.04
South Rumball Creek	5.05
Moultell Creek	1.82
Palmer Creek (Palmer 1 Residual Stream)	1.93
Syphon Creek (Syphon 1 Residual Stream)	1.03
Turner Creek Residual Streams (1 – 4)	1.09
Leonard Creek (Leonard 1 Tributary)	0.37
Hobson Creek (Hobson 1 Residual Stream)	1.13
Canoe Creek (Canoe 1 Tributary)	0.33
Gordon Creeks (Trim only)	2.57
Totals	24.90

2.1 Salmon River Watershed (Streams: S1-S5, Moultell and Rumball)

The Salmon River watershed included the Salmon River, Rumball Creek, South Rumball Creek, Moultell Creek, Gordon Creek, South Gordon Creek and 5 un-named tributaries labeled as S3 – S7 as well as one residual stream mapped as S8. The Riparian bands bordering the Salmon River main stem, as well as most of its tributaries were mixed herbaceous bands, including row crops and non-native grasses such as orchard grass. Thin disturbed shrub layers were also present in the immediate vicinity of the Salmon River main stem as well as its tributaries. In certain areas these bands were absent all together and presented an opportunity for enhancement by way of riparian *plantings* (see *App. 1, Rumball Segment 1 Enhancement Point 1*). The dominant hydraulic type of the main stem was a run, with riffle pool and cascade pool for segments in steeper gradients. Cattle and other livestock use in tributary streams may be impacting riparian vegetation cover and stream bank stability. Opportunities for enhancement were noted for creation of riparian fences, which limit access to streams by cattle (refer cattle X points) and provide opportunities for riparian vegetation to recover. Obstruction points such as small dams and weirs were common on many of the Salmon River tributaries. Moultell Creek had particularly steep topography including a number of obstruction points (see *App. 1, Moultell Segment 3 Obstruction Points 7-12*). Numerous wells and pipes were noted throughout segments 3 and 4 of this creek.

2.2 Turner Creek Watershed

Residual creeks in the Turner Creek watershed were primarily in an urban setting. Streams were generally well shaded by mature broadleaf forest riparian bands with some evidence of urban encroachment. The primary hydrology type was a run with some riffle/pool in steeper segments. Opportunities for enhancement included; removal of garbage/pollution and introduction of riparian

plantings where streams bordered open canopies (see *App. 1, Turner 1 Enhancement Point 1*). A partially obstructed culvert was noted on Turner 1 (see *photo Turner 1 Obstruction Point 1*).

Turner 2 Creek runs north of 17 Street SE, near Bayview Townhomes to 11 Street SE. Segment 1 was identified in the Broadleaf Forest riparian band in a natural undisturbed gully. Segment 2 was located between residential areas with vegetation cover primarily made up of shrubs and evidence of bank disturbance/ encroachment from residential yard cuttings. The main hydraulic type in both segments was cascade-pool. Trailing nightshade (*Solanum dulcamara*), an invasive plant species, was noted in high abundance with distribution throughout stream segment 1.

2.3 Palmer Creek Watershed

The two streams mapped in this watershed converged before ending up in street side ditches. The Riparian bands for these segments included a combination of mature mixed forest with an urban qualifier. The creeks flowed down steeper topography in primarily riffle pool type stream morphology. Key enhancements opportunities included removal of obstructions like persistent debris (see *App. 1, Palmer 1 segment 6 obstruction point 3*).

2.4 Syphon Creek Watershed

In the Syphon Creek area a small stream was found connecting Syphon Segments 9 and 17. Essentially this segment was characterized as a deep ditch line through a network of culverts. The creek crossed under the Trans-Canada Highway before connecting with Segment 17 and terminating in Shuswap Lake.

2.5 Canoe Creek Watershed

A small creek draining from wetland #34 was found to have wetland associated riparian bands (Wm05). The creek was a run hydraulic type and was bordered for a short distance by cattail and herb/grass riparian bands before it entered a road side ditch which drained into the Canoe Creek main stem.

2.6 Leonard/Hobson Watersheds

Two residual creeks were added to the Leonard and Hobson Watershed. Hobson 1 Creek had a run hydraulic type which followed ditch lines before entering an underground storm sewer. The riparian bands were urban medium imperviousness in segment 1 followed by row crops in segment 2. Enhancement opportunities were identified as riparian plantings (see *App. 1, Hobson 1 Enhancement Point 1*). Leonard 1 Creek was identified as having a run hydraulic type which originated out of wetland # 87. The creek flowed through an agricultural ditch before joining the Leonard Creek main stem.

3. 2013 WIM Summary

3.1 Wetland Class and Proper Function Condition

All wetlands were classified according to *Wetlands of British Columbia – A Guide to Identification (Mackenzie and Moran, 2004)* and a proper function condition assessment was completed based on *Riparian Area Management, Process for Assessing Proper Functioning Condition (Prichard, 1998)*. The results of the wetland inventory indicated a variety of wetland classes as well as the highest incidence of wetland inventoried in the Canoe Creek and Salmon River watersheds. Leonard and Hobson Creek watershed areas had the largest area of wetlands 9.7 ha in total followed by Canoe Creek with 7.1 ha. Marshes and flood classes were common in all watersheds inventoried and were associated mostly with the Cattail wetlands. The Great Bulrush marshes (Wm06) dominated the areas inventoried in

2013 totaling 6.6 ha. This wetland association primarily occurred in the Leonard Creek watershed. Cotton Wood associated wetlands (Fm01, Fm02) had the highest occurrence in flood prone areas totaling 5.3 ha. Cattail (Wm05) and Orchard Grass (Wm00) were most common in areas having shallow water systems < 1.0 m depth, and located in low lying, low elevation sites. Sitka Willow flood associations were most common along low gradient stream systems in areas prone to flooding. These were often found scattered on the outside edge of the riparian zone with Orchard Grass. Wetland sizes varied, the largest wetland was identified in the Leonard Creek watershed, wetland #87 with an area 9.7 ha. The overall average wetland size was approximately 0.5 ha. A summary of the wetland classes and features identified as part of the wetland inventory are provided in Table 2.

Table 2. Wetland Class Summary

Wetland Class/Riparian Feature	Watershed/ Sub-basin					Total Hectares
	Canoe	Hobson/ Leonard	Turner	Cress	Salmon River	
Wm06: Great Bulrush	0.05	6.56	0.03			6.64
Wm05: Cattail	2.24		0.61	0.15	0.79	3.79
Wm01: Beaked sedge – Water sedge	0.02		0.03			0.05
Wm00: Disturbed					0.66	0.66
SW : Shallow water	0.19		0.23	0.05	1.15	1.62
Fm00: Disturbed	0.01				3.39	3.4
Fm01: Cottonwood – Snowberry - Rose	0.27	1.79	0.04		0.65	2.75
Fm02: Cottonwood – Spruce-Red osier	0.77	1.32	0.26		0.17	2.52
FI01: Mountain Alder – Common Horsetail				0.03		0.03
FI02: Mountain alder – Red-osier Dogwood				0.02		0.02
FI03: Pacific willow – Red osier - Horsetail	0.88					0.88
FI04: Sitka Willow – Red-osier Dogwood	2.63		0.01			2.64
Totals (Hectares)	7.06	9.67	1.21	0.25	6.81	25.00

Functional at risk wetlands accounted for 74% of all wetlands by area. These wetlands were identified as functional and provided valuable aquatic and riparian habitat, but wetland attributes, such as soil, water, and vegetation features, were identified as “at risk”. These risk factors may be based on natural succession, influenced from adjacent land use practices or a combination of both. Two percent of the wetland areas were identified as non-functional. These were isolated and in most cases were the result of land use disturbance. Table 3 provides a summary of the Function Condition.

Table 3. Proper Function Condition Summary

Function Condition			Watershed/ Sub-basin			Total Hectares
	Canoe	Hobson/ Leonard	Turner	Cress	Salmon River	
Functional	1.89		0.19	0.09	3.83	6.00
Functional at Risk	5.02	9.67	1.01	0.17	2.63	18.50
Non-Functional	0.14				0.36	0.50
Totals (Hectares)	7.05	9.67	1.2	0.26	6.82	25.00

3.2 Wetland Habitat Enhancement Opportunities and Management Considerations

As part of the wetland inventory work, habitat information was collected along with observations of any species of interest or species protected under the Species at Risk Act. In contrast to the 2012 wetland inventory work where two species were identified, no species of interests or Species at Risk were observed during the 2013 wetland inventory.

It is important to note that the WIM work carried out only provides general observations of species and species habitat and that it should not be considered a comprehensive species at risk inventory.

4. Recommendations

The SHIM and WIM data collected in 2013 was consistent with the standards used in 2012 and should be integrated with that work to expand on the stream and wetland features in the city's GIS management environment. Similar to 2012, the recommendations for 2013 focus on utilizing the SHIM and WIM data to assist with city planning in and around sensitive areas. The data generated through two seasons of inventory work provides in-depth information on aquatic and riparian habitats relative to land uses and drainage systems. This information can be used to compliment more detailed studies on fish habitat, sediment and erosion sources, and stream and riparian enhancement prescriptions to name a few. SHIM data, when combined with GIS modeling, can also be effective in understanding natural drainage patterns, protecting sensitive habitats, and guiding environmentally sound choices in day-to-day operations.

APPENDIX 1

2013 SHIM PHOTO DOCUMENTATION

Table of Contents

SALMON RIVER	1
RUMBALL CREEK	2
SOUTH RUMBALL CREEK	5
S3 CREEK.....	7
S4 CREEK.....	8
S5 CREEK.....	10
S7 CREEK.....	10
S8 CREEK.....	10
MOUTTELL CREEK.....	11
TURNER 1 CREEK.....	14
TURNER 2 CREEK.....	14
TURNER 3 CREEK.....	15
HOBSON 1 CREEK.....	16
SYPHON 1 CREEK.....	16
LEONARD 1 CREEK.....	17
PALMER 1 CREEK.....	17
CANOE 1 CREEK	19

SHIM Stream Photos

Salmon River



Salmon River, Segment 1A



Salmon River, Segment 1B



Salmon River, Segment 1B, Enhancement 1



Salmon River, Segment 1B, Enhancement 2



Salmon River, Segment 1B, Enhancement 3



Salmon River, Segment 1A, Enhancement 4

Rumball Creek



Rumball, Segment 1



Rumball, Segment 2



Rumball, Segment 1A



Rumball, Segment 2A



Rumball, Segment 3



Rumball, Segment 3A



Rumball, Segment 4A



Rumball, Segment 4



Rumball, Segment 1, Enhancement Point 1



Rumball, Segment 1, Enhancement Point 2



Rumball, Segment 4, Enhancement Point 3



Rumball, Segment 1, Obstruction Point 1



Rumball, Segment 2, Obstruction point 2



Rumball, Segment 3, Obstruction Point 3



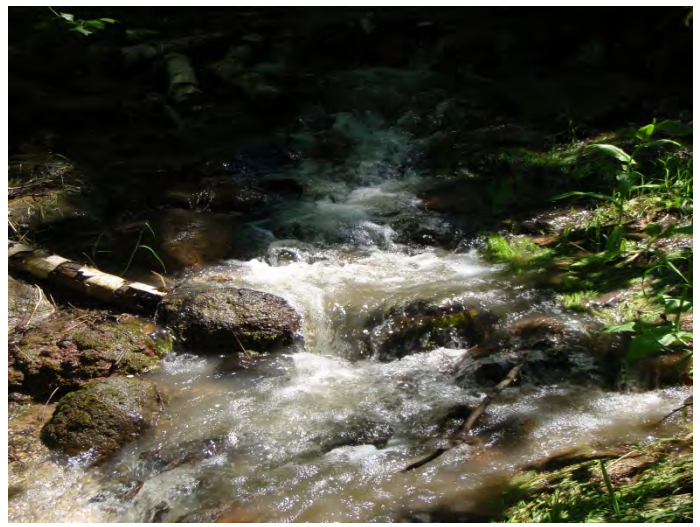
Rumball, Segment 4, Enhancement Point 4



Rumball Enhancement Point 5



Rumball, Segment 3, Obstruction Point 4



Rumball, Segment 4A, Obstruction Point 5

South Rumball Creek



South Rumball, Segment 1



South Rumball, Segment 2



South Rumball, Segment 3



South Rumball, Segment 4



South Rumball, Segment 5



South Rumball, Segment 5, Obstruction Point 1



South Rumball, Segment 5, Obstruction Point 2



South Rumball, Segment 5, Enhancement Point 1



South Rumball, Segment 5, Enhancement Point 2



South Rumball, Segment 4, Enhancement Point 3



South Rumball, Segment 2, Enhancement Point 4



South Rumball, Segment 4, Obstruction Point 3



South Rumball, Segment 3, Obstruction Point 4

S3 Creek



S3, Segment 1



S3, Segment 2



S3, Segment 3



S3, Segment 1, Obstruction Point 1



S3, Segment 2, Obstruction Point 2



S3, Segment 2, Enhancement Point 1



S3, Segment 3, Obstruction Point 3

S4 Creek



S4, Segment 1



S4, Segment 2



S4, Segment 3



S4, Segment 4



S4, Segment 5



S4, Segment 6



S4, Segment 6, Enhancement Point 1

S5 Creek



S5, Segment 1

S7 Creek



S7, Segment 1

S8 Creek



S8, Segment 1

Moultell Creek



Moultell, Segment 1



Moultell, Segment 2



Moultell, Segment 3



Moultell, Segment 4



Moultell, Segment 2, Enhancement Point 1



Moultell, Segment 2, Enhancement Point 2



Mouzell, Segment 2, Obstruction Point 1



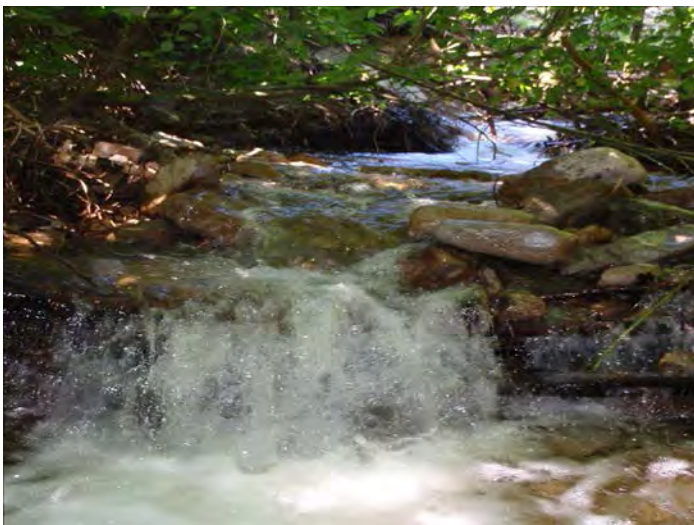
Mouzell, Segment 2, Obstruction Point 2



Mouzell, Segment 2, Obstruction Point 3



Mouzell, Segment 3, Obstruction Point 4



Mouzell, Segment 3, Obstruction Point 5



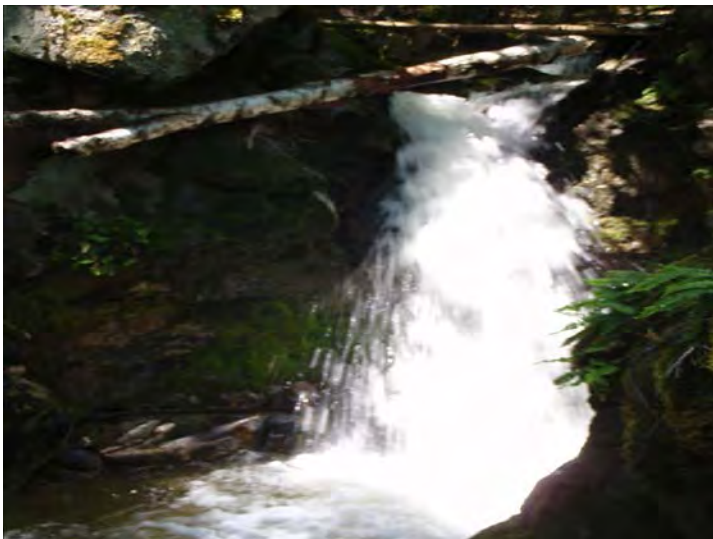
Mouzell, Segment 3, Obstruction Point 6



Moultell, Segment 3, Obstruction Point 7



Moultell, Segment 3, Obstruction Point 8



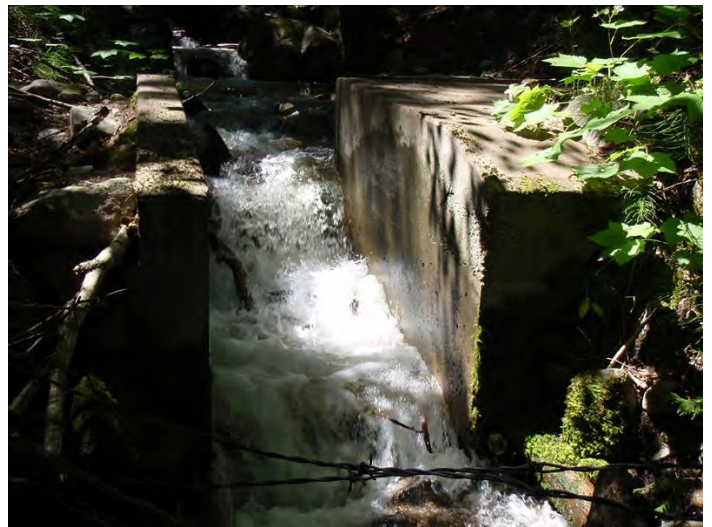
Moultell, Segment 3, Obstruction Point 9



Moultell, Segment 3, Obstruction Point 10



Moultell, Segment 3, Obstruction Point 11



Moultell, Segment 3, Obstruction Point 12

Turner 1 Creek



Turner 1, Segment 1



Turner 1, Enhancement Point 1



Turner 1, Obstruction Point 1

Turner 2 Creek



Turner 2, Segment 1



Turner 2, Segment 1, Enhancement 1



Turner 2, Segment 2



Turner 2, Segment 2, Enhancement 2

Turner 3 Creek



Turner 3, Segment 1



Turner 3, Obstruction Point 1



Turner 3, Enhancement Point 1

Hobson 1 Creek



Hobson 1, Segment 1



Hobson 1, Segment 1, Enhancement Point 1



Hobson 1, Segment 2



Hobson 1, Segment 2, Enhancement Point 2

Syphon 1 Creek



Syphon 1, Segment 1



Syphon 1, Segment 2

Leonard 1 Creek



Leonard 1, Segment 1

Palmer 1 Creek



Palmer 1, Segment 1



Palmer 1, Segment 2



Palmer 1, Segment 3



Palmer 1, Segment 4



Palmer 1, Segment 5



Palmer 1, Segment 6



Palmer 1, Segment 3, Obstruction Point 1



Palmer 1, Segment 6, Enhancement Point 1



Palmer 1, Segment 2, Obstruction Point 2



Palmer 1, Segment 6, Obstruction Point 3



Palmer 1, Segment 4, Obstruction Point 4

Canoe 1 Creek



Canoe 1, Segment 1

APPENDIX 2

2013 WIM PHOTO DOCUMENTATION

Table of Contents

72. Fm00-Fm01	3
73. SW-Wm06-Fm02	3
74. Wm00	3
75. Fm01-Wm00	3
76. Fm00	3
77. Wm00	3
78. Wm00	4
79-80. Fm02-Wm05	4
81. Fm01-Wm05	4
82. Wm05	4
83. Wm05	4
84. Fm00-Wm05	5
85. Fm00-Wm05	5
86. Fm00-Wm05	5
87. Fm01-Fm02-Wm06	5
88. SW-Fm01	5
89. Wm05	5
90. Fm02-Wm05	6
91. Fm01-Wm01	6
92. SW-Wm05	6
93. SW-Fm02-Wm05	6
94. SW-Fm02-Wm05	6
95. SW-Wm05	6
96. SW-Wm05	7
97. Wm05	7
98. FI01-Wm05	7
99. FI02-Wm05	7
100. Wm05	7
101, 102, 103. FI04-Wm05	7
104. Fm02-Wm05	8
105. FI02-Wm05	8
106. Fm02-Wm05	8
107. Wm05	8
108. FI04-Wm05	8
109. Wm05	8
110. Fm00-Wm05	9
111. Wm05	9
112. Wm05	9
113. Fm01-Wm01	9
114. SW-Fm01-Wm06	9
116. SW-Fm01	9
117. Wm05	10
118. SW	10
119. SW	10
120. Wm00	10

Wetland Photos



72. Fm00-Fm01



73. SW-Wm06-Fm02



74. Wm00



75. Fm01-Wm00



76. Fm00



77. Wm00



78. Wm00



79-80. Fm02-Wm05



81. Fm01-Wm05



82. Wm05



83. Wm05



84. Fm00-Wm05



85. Fm00-Wm05



86. Fm00-Wm05



87. Fm01-Fm02-Wm06



88. SW-Fm01



89. Wm05



90. Fm02-Wm05



91. Fm01-Wm01



92. SW-Wm05



93. SW-Fm02-Wm05



94. SW-Fm02-Wm05



95. SW-Wm05



96. SW-Wm05



97. Wm05



98. FI01-Wm05



99. FI02-Wm05



100. Wm05



101, 102, 103. FI04-Wm05



104. Fm02-Wm05



105. FI02-Wm05



106. Fm02-Wm05



107. Wm05



108. FI04-Wm05



109. Wm05



110. Fm00-Wm05



111. Wm05



112. Wm05



113. Fm01-Wm01



114. SW-Fm01-Wm06



116. SW-Fm01



117. Wm05



118. SW



119. SW



120. Wm00