CROWN CAPITAL ENTERPRISE LIMITED

WANCHAI, HONG KONG

RJSeal™ Application
HuBao Expressway,
Inner Mongolia,
Peoples Republic of China

November 2005

TS^2 Consulting Inc.
Lamma, Hong Kong

CROWN CAPITAL ENTERPRISE LIMITED

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Application of RJSeal^{T}
HuBao Expressway, Inner Mongolia
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1.0 INTRODUCTION

Crown Capital Enterprise Limited of Hong Kong entered into an arrangement in October 2005 with the HuBao Expressway YiJianFang Maintenance Company, which is responsible for the maintenance of the HuBao Expressway in proximity to the city of HuShi. This arrangement calls for the analysis of the performance of RJSeal^{TM}, a sealer/rejuvenator for asphalt pavement on HuBao Expressway; near the city of HuShi, some 50 km's west of Hohhot, the Capital City of Inner Mongolia.

Inner Mongolia is situated in the upper northeastern portion of China bordering Outer Mongolia. The capital city of Inner Mongolia is Hohhot with a population of approximately 2.1 million. The population is composed of forty-nine nationalities which include the Mongolian, Han, Hui, Manchu, Korean, Daur, Ewenki, and Oroqen peoples.

Inner Mongolia has a climate that is typical of an intermediate-temperate zone. The weather is characterized by the scantiness of rainfall as well as drastic changes of temperature. The temperature varies greatly between day and night. July is the hottest month of summer and the temperature varies between 15 Celsius and 27 Celsius. The coldest month is January in the winter where the weather ranges from -10 Celsius to -32 Celsius. See figure 1.0 for a map showing the location of Inner Mongolia, and Hohhot.

The predominant feature of the topography is the extensive grasslands, as well as outwash and moraines from the last glacial period. The asphalt concrete in the area is manufactured from locally sourced aggregate materials, which are comprised of crushed and screened sandstone and diorites hauled in from quarries elsewhere in Inner Mongolia, as well as washed gravels from the various rivers. The bitumen binder is probably sourced from refineries located outside China.


N
RUSSIA
MONGOLIA
INNER MONGOLIA AUTONOMOUS
SHANXI
Hohhot
Baotou
Chifeng
China
Mongolia
Russia
Beijing
Job Site
Crown Capital Enterprise Limited
HuBao Expressway
General Location Map
Figure 1.0

2.0 CO-OPERATIVE PROGRAM

The intent of the arrangement with HuBao Expressway YiJianFang Maintenance Company, which is responsible for the HuBao Expressway, is to demonstrate RJSeal™ at a location selected by the Maintenance Division. The Application will subsequently allow analysis of the performance of RJSeal™ on a variety of asphalt surfaces. An application was undertaken on at the asphalt apron in front of the toll booth plaza and after the toll booth plaza on the HuBao Expressway, near HuSi, some 50 km's west of the city of Hohhot. The work was undertaken on November 12, 2005. The portion of the asphalt apron that was treated is composed of asphalt pavement, probably some 25 centimetres thick, which overlays a silty sand.

The age of the asphalt pavement is circa 2002. Keen interest was expressed in having the life of the asphalt pavement extended on this highway. The asphalt pavement has a number of lateral cracks. Smaller cracks also exist and the road maintenance department wished to prevent water percolating through these cracks in the asphalt pavement, thus softening the sub-grade.

3.0 RJSeal™

RJSeal™ is a proprietary product that is supplied by Crown Capital Enterprise Limited of Wanchai, Hong Kong. RJSeal™ has been proven in numerous applications in North and South America and recently in China to rejuvenate asphalt pavement at various stages of its life and economically extend the life of the pavement. RJSeal™ is a three component, asphalt sealer rejuvenator that is comprised of Coal Tar, Coal Tar Oils and Petroleum Solvents.

3.1 PRIOR EXPERIENCE

Refer to Appendix A for a copy of the brochure which outlines the experience with RJSeal™ at various locations in North America and South America as well as China. Further information is available from Crown Capital Enterprise Limited. RJSeal™ has been used at numerous airports in North and South America, as well as highways in Alberta, Canada; Cearo State, Brazil and other locations in the U.S.A. Since 2000, RJSeal™ has been demonstrated successfully at over fifty (50) locations in China and sixty (60) commercial-scale applications have taken place at various locations, including Shanghai, DaQing, Kunming and QinHuangDao.

4.0 TEST PROGRAM

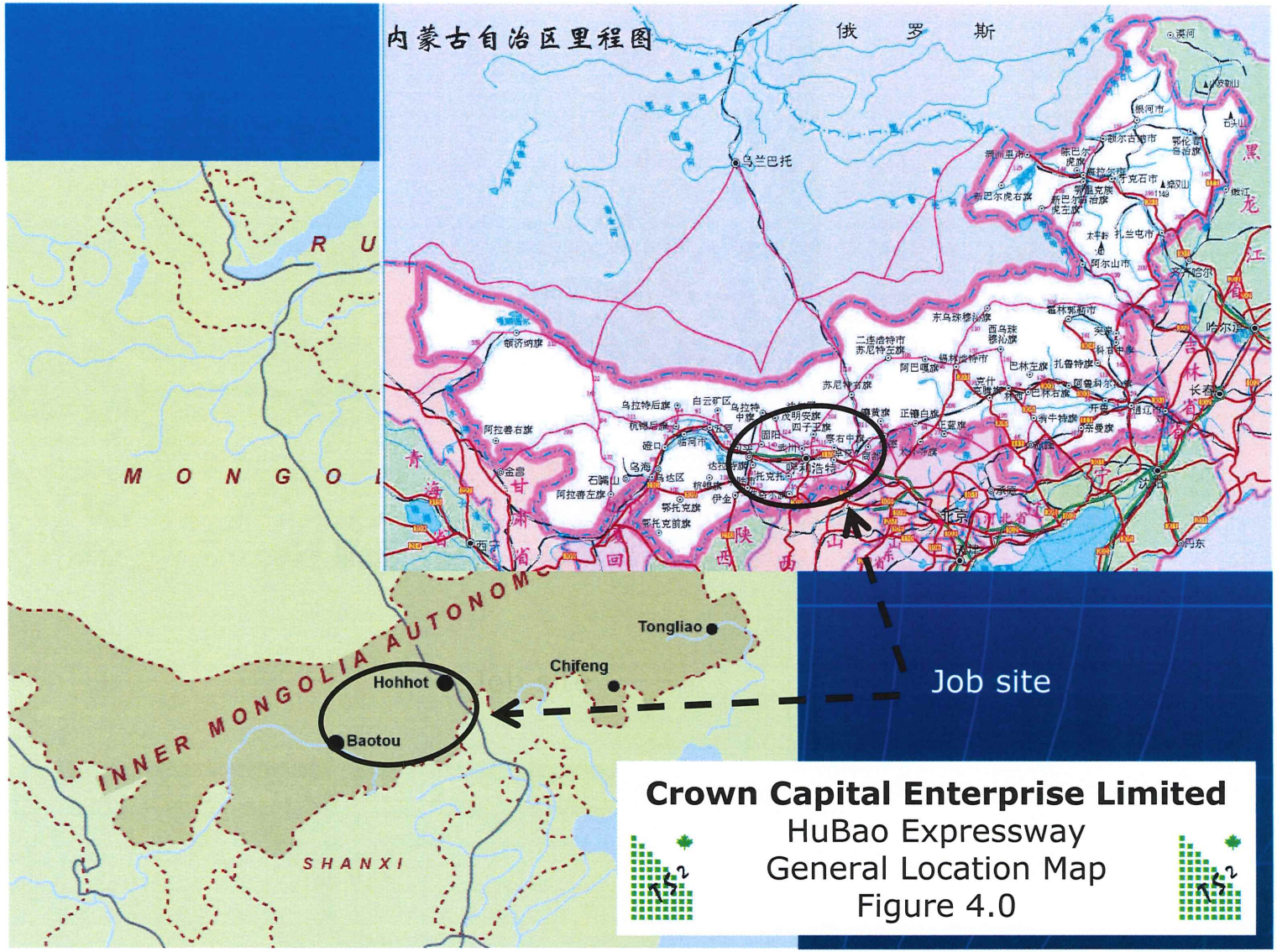
Since Inner Mongolia is located in a northern climate (Latitude: 43 to 53 North) at a high altitude (1500 to 2000 metres), it's a demanding setting for asphalt, given the climate (extremes of 45 Celsius in summer and minus 25 Celsius in the winter) and intense exposure to ultraviolet radiation, all which contribute to the oxidation and breakdown of the asphalt binder.

Inner Mongolia has a significant concentration of highways, with some 10,000 kms of National and Provincial Highway. The HuBao Expressway YiJianFang Maintenance Company is responsible for the maintenance of the HuBao Expressway.

In view of this extensive network of roads and the relatively short life of the asphalt surface, The Highway Maintenance Department is definitely interested in determining how to economically extend the life of the asphalt road surface. To this end, they agreed to try RJSeal^{TM} on the HuBao Expressway, some 50 kilometres west of the city of Hohhot. See Figure 4.0, showing the location of this Highway with respect to BaoTaou and HuShi

On November 12, 2005 a demonstration was undertaken on the asphalt apron immediately in front of and following the six toll booths on the HuBao Expressway, (a four lane, divided highway) with RJSeal^{TM}. The location selected for an application of RJSeal^{TM} was nominally at Km marker 420+212, nominally at the following geographic location:

Table 4.1	Geographic Location of Test Strip on HuBao Expressway		
Test Strip	**System i.e. Geographic or Universal Transverse Mercator (UTM)**	**Northing**	**Easting**
East End	Geographic (deg, min)		
	UTM Grid (52T) (metres)		
West End	Geographic (deg, min)		
	UTM Grid (52T) (metres)		


内蒙古自治区里程图
俄 罗 斯
乌兰巴托
M O N G O L I A
INNER MONGOLIA AUTONOMOUS
SHANXI
Tongliao
Chifeng
Hohhot
Baotou
Job site
Crown Capital Enterprise Limited
HuBao Expressway
General Location Map
Figure 4.0

Particulars of the test strips are shown in the table that follows:

Table 4.2				Particulars of the Test Strip on HuBao Expressway							
Work Time	Strip Width (m)	Strip Length (m)	Total Area (m^2)	Total Area yd^2	RJSeal™ Applied			Application Rate			
					US gals	Litres	Kgs	US Gal /yd^2	litres /m^2	m^2 /Litre	m^2 /Kg
09:00 – 16:00	7.0	1,282	8,712	10,414	449	1,698	1800	0.043	0.19	5.13	4.84

Subsequent inspection of the demo application, showed that the application rate of 4.84 m^2/kg was adequate for the asphalt pavement at this location.

The section selected for the application on the HuBao Expressway is comprised entirely of asphalt pavement. Copper slag was applied at an application rate of 0.21 kg/square metre, following the application of the RJSeal™.

See figure 4.0 for the location of the test strip with respect to the city of Hohhot. The test strip location is graphically shown in figure 4.1, which follows.

Figure 4.1 Test Strip on HuBao Expressway.

There is a slight camber to the road, which causes water to run off toward the shoulder, rather than puddle on the road. No significant oil spills were observed, just the occasional drop of transmission oil, crankcase oil or hydraulic fluid. The asphalt pavement surface was not appreciably worn with no rutting due to traffic wear. There was aging and oxidation of the bitumen, which extended to a depth of several millimetres. There were lateral cracks,. The entire portion of the treated asphalt pavement section overlies a compacted silty-clay, sub-grade

RJSeal™ was applied, using a Desco D200 Sprayer. See Appendix B for technical information on this unit. This unit can uniformly apply the RJSealTM in the application.

Ambient temperatures at the time of the application on November 12 were in the 6 degree Celsius range, with humidity in the 50% range. Photos showing the test application of RJSeal™ follow in figures 4.2, 4.3 and 4.4. on the following pages.

A site visit on November 13, 2005 was made to check to entire test section and evaluate the penetration of the RJSealTM. A difference was readily perceived between the RJSeal™ treated sections and the adjoining untreated lanes. A screwdriver was used to dig several small holes in the asphalt pavement, to determine the penetration of the RJSeal™. At these locations the rejuvenated surface was evident, by the black resilient surface layer, which was now approximately 1 centimetre thick. Below that depth, the grey, oxidized layer of asphalt was evident.

Figure 4.2 Typical Application Procedure.

Figure 4.3 Slag application.

Figure 4.4 Finished Surface.

4.1 RJSeal™ Testing

To date the comparison of the asphalt treated with RJSeal™ has been compared on a subjective basis over a very short period on HuBao Expressway.

Additional testing equipment will be brought to the site for comparison on a more disciplined, objective basis in the future, and to this end, the following tests will be undertaken.

- Skid Resistance
- Water Penetration
- Macrotexture (Depth of Texture)

At a later date, cores will be acquired from the asphalt pavement for laboratory testing and the following properties of the asphalt pavement will be determined:

- Viscosity
- Ductility
- Penetration
- Softening Point

4.2 Skid Resistance

A British Pendulum ASTM Standard E303-93 OR China Standard T 0964-95) was employed to determine the skid resistance of the road surface prior to the application of RJSeal and also after the application.

Table 4.3 British Pendulum	Particulars of Westbound Test Loc'n		BPN	
Westbound Test Loc'n Kilometre Marker	Lane	Wheel Path	Before #	After #
K420+212	Fast Lane	left path	45	48
K420+212	Middle Lane	right path	44	46

The test results from the British Pendulum, are not directly correlatable with the sand patch test. A BPN of 42 is indicative of an acceptable road surface from a skid resistance point of view. Whereas a BPN of 26 infers that the road surface is unacceptable. See Figure 4.5 which follows showing the British Pendulum Testing.

Figure 4.5 British Pendulum Test

4.3 Water Penetration

Water Penetration Tests (China Testing Standard T 0730-2000) were undertaken at several locations on the HuBao Expressway on both the untreated segment as well as the segment following the application of RJSeal™. The test results are shown in the table that follows:

Table 4.4 Water Penetration	Particulars of Westbound Test Loc'n		Water Penetration	
Westbound Test Loc'n	Lane	Wheel Path	Before	After
Kilometre Marker			ml/min	ml/min
K420+212	Fast Lane	left path	0	0
K420+212	Middle Lane	right path	0	0

See Figure 4.6 that follows for a pictorial presentation of the Water Penetration Meter.

4.4 Macrotexture (Depth of Texture)

The sand patch test (ASTM Standard E965-96 OR China Standard T 0961-95) was used to ascertain the Pavement Macrotexture (Depth of Structure). Comparison was undertaken at several locations on both the untreated and RJSeal™ treated section in close proximity to the Water Penetration Meter tests. The results from the sand patch tests are shown in the table that follows

Table 4.5 Sand Patch Test	Particulars of Westbound Test Loc'n		Depth of Texture	
Westbound Test Loc'n	Lane	Wheel Path	Before	After
Kilometre Marker			mm	mm
K420+212	Middle Lane	left path	0.58	0.50
K420+212	Middle Lane	right path	0.53	0.49

See Figure 4.7 which follows, showing the sand patch testing procedure.

4.5 Ductility/Viscosity/Penetration Testing

This aspect of the testing is beyond the capabilities Crown Capital Enterprise Limited personnel and external assistance has been sought from outside experts in the field of Asphalt Testing. To this end, the HuBao Expressway YiJianFang Maintenance Company has retained an independent testing company to conduct tests on the treated section. This will be reported separately.

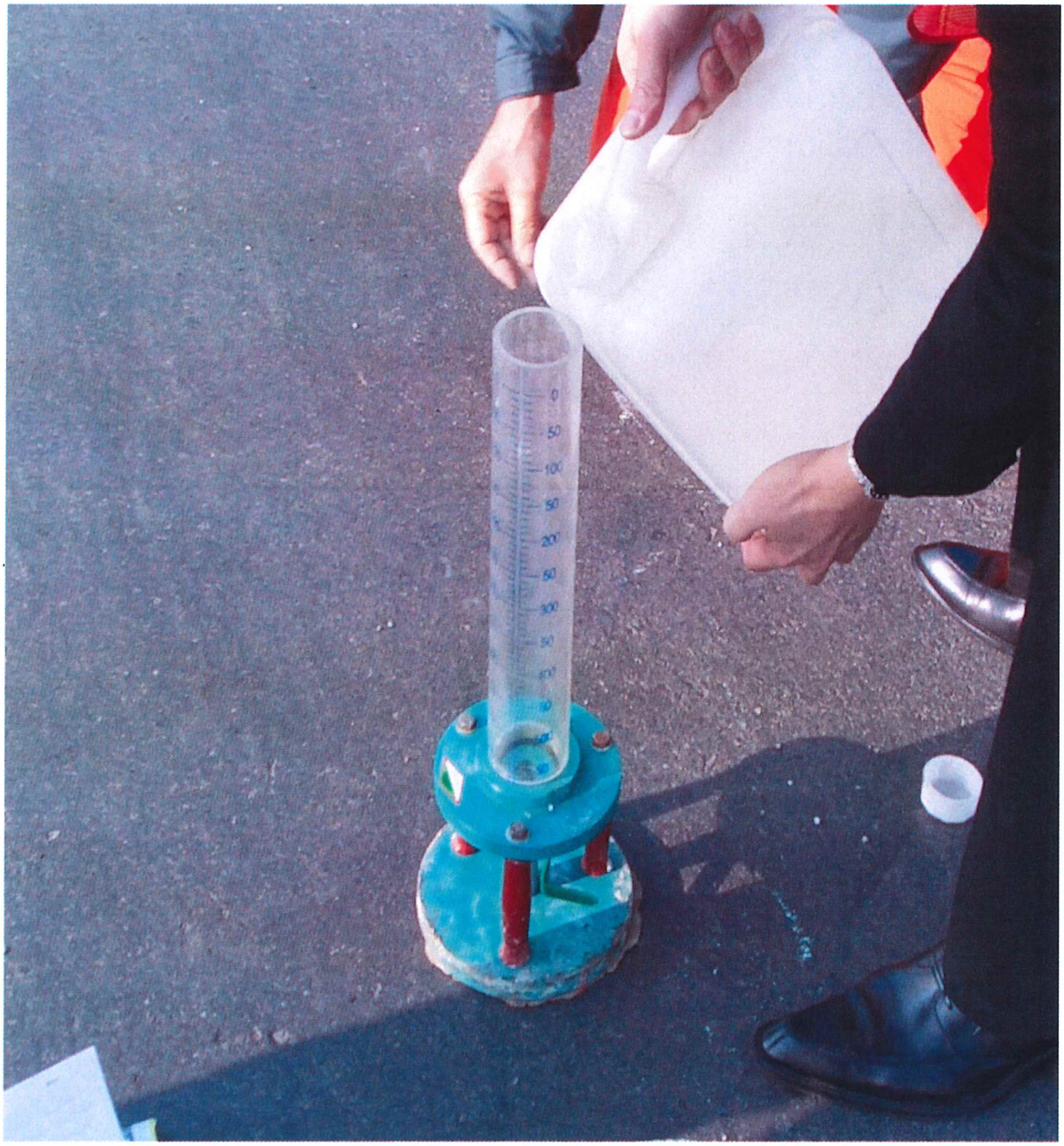


Figure 4.6 Water Penetration Test

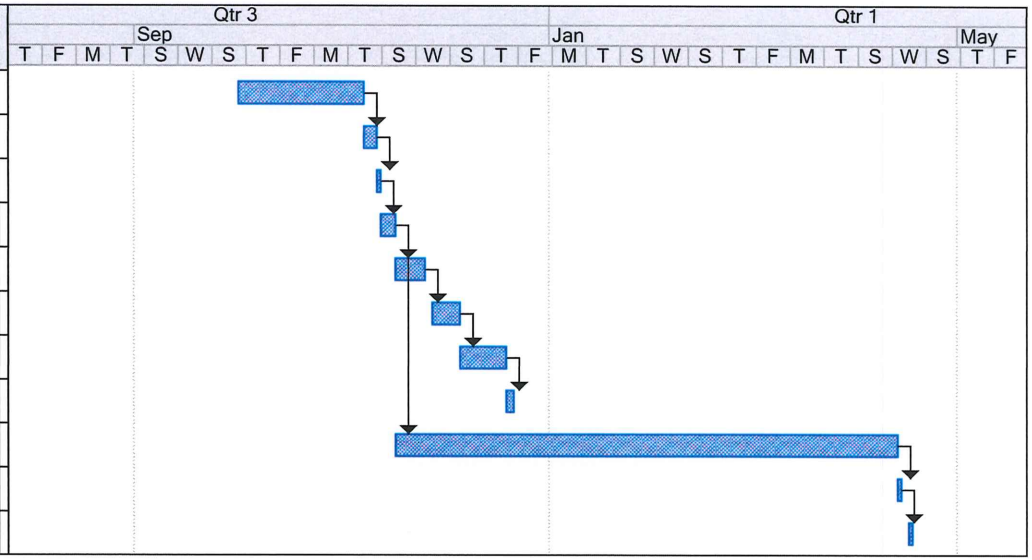
Figure 4.7 Sand Patch Test

5.0 Test Completion Schedule

The technicians from the testing laboratory, retained by the HuBao Expressway YiJianFang Maintenance Company will be dispatched to undertake further testing on the trial section in the near future. The projected completion of this testing is scheduled as shown in the following chart.

LiveProject - HuBao Expressway

ID	Task Name	Duration	Start	Finish	Predecessors	Successors
1	Negotiate Contrac	27 days	2/10/2005	7/11/2005		2
2	Mobilize Crew	4 days	8/11/2005	11/11/2005	1	3
3	RJSeal Demo	1 day?	12/11/2005	12/11/2005	2	4
4	Demobilize	4 days	13/11/2005	16/11/2005	3	9, 5
5	Hiatus	7 days	17/11/2005	25/11/2005	4	6
6	Report Preparatio	6 days	28/11/2005	5/12/2005	5	7
7	Hiatus	10 days	6/12/2005	19/12/2005	6	8
8	Report Completio	2 days	20/12/2005	21/12/2005	7	
9	Hiatus	106 days	17/11/2005	13/4/2006	4	10
10	Inspection	1 day	14/4/2006	14/4/2006	9	11
11	Testing	1 day	17/4/2006	17/4/2006	10	



Normal task: % complete: Milestone:

Split task: Summary task: External task:

Critical task: Rolled up Summary task: Deadline:

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Appendix A

RJSeal™ Descriptive Literature

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Appendix B

Desco D200 Sprayer

Technical Data

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