



**ឧបសម្ព័ន្ធ 7.3**

**ទីតាំងស្ថានីយបូមទឹកនៅ និងរោងចក្រប្រព្រឹត្តិកម្មទឹកស្អាត ពោធិសាត់**

**Intake and WTP Site in Pursat**

**ទីតាំងស្ថានីយបូមទឹកនៅ និងរោងចក្រប្រព្រឹត្តិកម្មទឹកស្អាតក្នុងក្រុងពោធិសាត់**

	ជម្រើស 1 (ស្ថានីយបូម៖ ដំណាក់អំពើល, WTP៖ លេខ 5)	ជម្រើស 2 (ស្ថានីយបូម៖ ក្បែរស្ថានីយបូមមានស្រាប់, WTP៖ លេខ 2)
<p>ប្លង់មើលពីលើ</p>		
<p>សង្ខេបអំពីស្ថានីយបូម និងបរិក្ខារ</p>	<p><b>ស្ថានភាពទីតាំង</b></p> <ul style="list-style-type: none"> <li>- កំពស់ទឹក៖ LWL+16.300ម, HWL+18.200ម បម្រែបម្រួលកំពស់ទឹក៖ 1.9m</li> <li>- ដី៖ 100មx100ម (សម្រាប់ស្ថានីយបូម និងទីតាំងបណ្តោះអាសន្ន)</li> <li>- ទឹកជំនន់ 1.0ម ពីនីវ៉ូដី នាឆ្នាំ 1996 និង 2006</li> </ul> <p><b>ការងារសំណង់សិរិល</b></p> <ul style="list-style-type: none"> <li>- បំពង់នាំទឹកនៅ៖ DIP350 x 8,300ម</li> <li>- រោងម៉ាស៊ីនបូម និងការងារបន្ទាប់បន្សំ : LxWxH=37.3មx8.4មx10.5ម</li> <li>- រោងម៉ាស៊ីនភ្លើង៖ LxWxH=6មx5មx4ម</li> <li>- ការលុបដី៖ 0.5ម ឡើងលើ (EL18.070ម→EL18.570ម)</li> </ul> <p><b>ការងារបណ្តោះអាសន្ន</b></p> <ul style="list-style-type: none"> <li>- Cofferdam of River Side, Steel Sheet Pile SP-III</li> <li>- Excavation by Open Cut</li> </ul> <p><b>ការងារមេកានិច</b></p> <ul style="list-style-type: none"> <li>- ប្រភេទម៉ាស៊ីនបូម៖ Horizontal End Suction Pump</li> <li>- កំពស់សម្ពាធបូម៖ 37m</li> <li>- ម៉ាស៊ីនបូម៖ 150មម/ 2duty +1 stand-by/ 30kW</li> <li>- Q=5.04ម³/នាទី</li> </ul>	<p><b>ស្ថានភាពទីតាំង</b></p> <ul style="list-style-type: none"> <li>- កំពស់ទឹក៖ LWL+11.635ម, HWL+17.635ម បម្រែបម្រួលកំពស់ទឹក៖ 6.0m</li> <li>- ដី៖ 50មx50ម, មានលំនៅដ្ឋាននៅក្បែរ។ (សម្រាប់ស្ថានីយបូម និងទីតាំងបណ្តោះអាសន្ន)</li> <li>- តំបន់ងាយជន់, ទឹកជំនន់ 2.0ម ពីនីវ៉ូដី នាឆ្នាំ 1996 និង 2006</li> </ul> <p><b>ការងារសំណង់សិរិល</b></p> <ul style="list-style-type: none"> <li>- បំពង់នាំទឹកនៅ៖ DIP350 x 1,500ម</li> <li>- រោងម៉ាស៊ីនបូម និងការងារបន្ទាប់បន្សំ : LxWxH=44.0មx8.1មx14.5ម</li> <li>- រោងម៉ាស៊ីនភ្លើង៖ LxWxH=6មx5មx4ម</li> <li>- ការលុបដី៖ 2.0ម ឡើងលើ (EL16.135ម→EL18.135ម)</li> </ul> <p><b>ការងារបណ្តោះអាសន្ន</b></p> <ul style="list-style-type: none"> <li>- Cofferdam of River Side, Steel Sheet Pile SP-IV</li> <li>- Retaining Wall for Civil Work Construction SP-IV</li> </ul> <p><b>ការងារមេកានិច</b></p> <ul style="list-style-type: none"> <li>- ប្រភេទម៉ាស៊ីនបូម៖ Horizontal End Suction Pump</li> <li>- កំពស់សម្ពាធបូម៖ 21m</li> <li>- ម៉ាស៊ីនបូម៖ 150មម/ 2duty +1 stand-by/ 15kW</li> <li>- Q=5.04ម³/នាទី</li> </ul>
<p>សង្ខេបអំពីទីតាំង WTP និងបរិក្ខារ</p>	<p><b>ស្ថានភាពទីតាំង</b></p> <ul style="list-style-type: none"> <li>- ទីតាំងជម្រើស លេខ 5</li> <li>- ក្រឡាផ្ទៃ៖ 100មx100ម</li> <li>- ទឹកជំនន់ 1.0ម ពីនីវ៉ូដី នាឆ្នាំ 1996 និង 2006</li> <li>- ចម្ងាយពីស្ទឹង៖ ប្រហែល 400ម</li> </ul> <p><b>ការងារសំណង់សិរិល</b></p> <ul style="list-style-type: none"> <li>- ការលុបដី៖ 1.0m up (EL17.650ម→EL18.650ម)</li> </ul>	<p><b>ស្ថានភាពទីតាំង</b></p> <ul style="list-style-type: none"> <li>- ទីតាំងជម្រើស លេខ 2</li> <li>- ក្រឡាផ្ទៃ៖ 100មx100ម, មានសាលាបឋមសិក្សានៅក្បែរ</li> <li>- តំបន់ងាយជន់, ទឹកជំនន់ 2.0ម ពីនីវ៉ូដី នាឆ្នាំ 1996 និង 2006</li> <li>- ចម្ងាយពីស្ទឹង៖ ប្រហែល 400ម</li> <li>- មានលំនៅដ្ឋានចំនួន 4 តាមបណ្តោយផ្លូវចូល</li> </ul> <p><b>ការងារសំណង់សិរិល</b></p>

ឧបសម្ព័ន្ធ 7.3 ទីតាំងស្ថានីយបូមទឹកនៅ និងរោងចក្រប្រព្រឹត្តិកម្មទឹកស្អាត រោងចក្រ

		ជម្រើស 1 (ស្ថានីយបូម៖ ដំណាក់កំពិល, WTP៖ លេខ 5)	ជម្រើស 2 (ស្ថានីយបូម៖ ក្បែរស្ថានីយបូមមានស្រាប់, WTP៖ លេខ 2)
		<ul style="list-style-type: none"> <li>- ការលុបដីតាមផ្លូវចូល៖ មិនចាំបាច់ (EL18.650ម)</li> <li><b>ការងារបណ្តោះអាសន្ន</b></li> <li>- ផ្លូវចូលតាមផ្លូវមេ</li> </ul>	<ul style="list-style-type: none"> <li>- ការលុបដី៖ 2.0m up (EL15.260m→EL17.260m)</li> <li>- ការលុបដីតាមផ្លូវចូល៖ 1.0ម (EL16.260ម→EL17.260ម)</li> <li><b>ការងារបណ្តោះអាសន្ន</b></li> <li>- ផ្លូវសាងសង់៖ L=500ម, W=10ម</li> </ul>
ស្ថានភាពប្រភពទឹក	ស្ថានភាពនៃការបូមយកទឹក	<ul style="list-style-type: none"> <li>○ប្រឡាយស្ទឹងមានស្ថេរភាព</li> <li>○មានកំណត់ត្រាទឹកបូមសម្រាប់ស្រោចស្រព</li> <li>○មានបរិមាណទឹក និងជម្រៅទឹកគ្រប់គ្រាន់នៅរដូវប្រាំង</li> </ul>	<ul style="list-style-type: none"> <li>○ប្រឡាយស្ទឹងមានស្ថេរភាព</li> <li>○នៅទីតាំងស្ថានីយបូមទឹកនៅដែលមានស្រាប់ (លើខ្សែទឹក)</li> <li>○មានបរិមាណទឹក និងជម្រៅទឹកគ្រប់គ្រាន់នៅរដូវប្រាំង</li> </ul>
	ស្ថានភាពកករ	<ul style="list-style-type: none"> <li>○គ្រាប់ខ្សាច់ និងបរិមាណខ្លះនៃខ្សាច់ដែលអណ្តែតប្រមូលផ្តុំនៅតំបន់អាងទំនប់។</li> <li>○លំហូរទឹកទាប ដោយសារតំបន់អាងទំនប់ជំនួយហើយបង្គោលទឹក និងការអណ្តែតនៃដីល្បាប់ មានកិច្ច។</li> <li>○បរិមាណកករ គិតជាដងជម្រើស 2 ហើយការខូចម៉ាស៊ីនបូម និងគិតជាដង។</li> </ul>	<ul style="list-style-type: none"> <li>▲ការផ្លាស់ទីនៃដីខ្សាច់ (bedload, floating sand wash load) ឆ្លាំងក្នុងកម្រិតមួយ។</li> <li>▲លំហូរទឹកលឿនក្នុងកម្រិតមួយ ហើយដីល្បាប់ងាយនឹងផ្លាស់ទី និងអណ្តែត។</li> <li>▲បរិមាណកករ ច្រើនជាងជម្រើស 1 និងមានភាគរយម៉ាស៊ីនបូមឆាប់ខូចខ្ពស់។</li> </ul>
ការសាងសង់	ភាពងាយស្រួលក្នុងការធ្វើការ	<ul style="list-style-type: none"> <li>○មិនចាំបាច់ធ្វើសំណង់បណ្តោះអាសន្នខ្នាតធំ ពីព្រោះបម្រែបម្រួលកំពស់ទឹកនៅរដូវប្រាំង និងរដូវវស្សា គឺថា។</li> <li>○ចរាចរណ៍របស់គ្រឿងចក្រងាយស្រួល ពីព្រោះសណ្ឋានដីរាបស្មើ ហើយមានស្ថេរភាពល្អដល់គ្រឿងចក្រ។</li> <li>○ងាយចេញចូលពីផ្លូវមេ។</li> </ul> <p>○រយៈពេលសាងសង់ស្ថានីយបូមខ្លីជាង ពីព្រោះទំហំស្ថានីយ (អាងពង្រងដំបូង និងអាគារបូម) តូចជាង ជម្រើស 2។</p> <p>▲ត្រូវការពេលច្រើនដើម្បីដំឡើងបំពង់នាំទឹកនៅដោយសារចម្ងាយវែង។</p>	<ul style="list-style-type: none"> <li>▲ចាំបាច់ធ្វើសំណង់បណ្តោះអាសន្នខ្នាតធំ ពីព្រោះបម្រែបម្រួលកំពស់ទឹកនៅរដូវប្រាំង និងរដូវវស្សា និងមានផ្ទះទាំងឡាយនៅក្បែរ។</li> <li>▲ចរាចរណ៍របស់គ្រឿងចក្រ មានការលំបាកដោយសារទិដ្ឋាការខ្លាចចង្អៀត និងមិនមានស្ថេរភាពល្អដល់គ្រឿងចក្រដែលមានរំញ័របានឡើយដោយសារសណ្ឋានដី មិនស្មើល្អ។</li> <li>▲ពិបាកដល់គ្រឿងចក្រចេញចូល ពីព្រោះផ្លូវទៅកាន់ WTP តូចចង្អៀត និងកាត់តាមលំនៅដ្ឋាននានា ត្រូវការចាក់ដីបំពេញ និងពង្រីកផ្លូវចេញចូល ឬចាំបាច់ត្រូវផ្តល់ផ្លូវថ្មី។</li> <li>▲រយៈពេលសាងសង់ស្ថានីយបូមវែង ដោយសារទំហំស្ថានីយធំ (ស្ថានីយបូម និងការងារបន្ទាប់បន្សំ) ធំជាងជម្រើស 1។</li> <li>○ប្រវែងបំពង់នាំទឹកនៅខ្លី ដែលនាំអោយរយៈពេលដំឡើងខ្លី។</li> </ul>

ឧបសម្ព័ន្ធ 7.3 ទីតាំងស្ថានីយបូមទឹកនៅ និងរោងចក្រប្រព្រឹត្តិកម្មទឹកស្អាត ពោធិសាត់

		ជម្រើស 1 (ស្ថានីយបូម៖ ដំណាក់កំពិល, WTP៖ លេខ 5)	ជម្រើស 2 (ស្ថានីយបូម៖ ក្បែរស្ថានីយបូមមានស្រាប់, WTP៖ លេខ 2)
	ការប៉ះពាល់ដល់បរិស្ថានជុំវិញ	<ul style="list-style-type: none"> <li>○មិនចាំបាច់មានការសាងសង់នៅ ក្បែរព្រៃព្រះមានលំនៅដ្ឋានតែពីរបីនៅក្បែរទីតាំងស្ថានីយបូម និង WTP។</li> <li>○មិនមានលំនៅដ្ឋាននៅក្បែរទីតាំង WTP ទេ។</li> <li>○មិនមានសំណង់សំខាន់ៗ នៅក្បែរទីតាំង WTP ទេ។</li> </ul>	<ul style="list-style-type: none"> <li>▲ចាំបាច់មានការសាងសង់នៅ ក្បែរព្រៃព្រះមានលំនៅដ្ឋាននានានៅក្បែរទីតាំងស្ថានីយបូម និង WTP។</li> <li>▲ប៉ះពាល់ដល់លំនៅដ្ឋាន ពេលពង្រីកផ្លូវចេញចូលទីតាំង WTP។</li> <li>▲ការប្រើប្រាស់សាលាបឋមសិក្សាចេញចូលទៅកាន់រោងចក្រប្រព្រឹត្តិកម្មទឹកស្អាត មិនមែនជាជម្រើសល្អទាក់ទងនឹងសុវត្ថិភាពឡើយ។ គេត្រូវរៀបចំដូចជា ផ្លូវរាង ឬផ្លូវដល់សិស្សសាលាបណ្តោះអាសន្ន។ លើសពីនេះ អាចមានផលប៉ះពាល់សកម្មភាពសាលាដោយសារសំឡេង និងរញ្ជ័រ ក្នុងកំឡុងពេលសាងសង់។ ដូច្នេះ គេត្រូវចាត់វិធានការដោះស្រាយ។</li> </ul>
អាការនានា	អាការប្រភេទសំណង់ស៊ីវិល	<ul style="list-style-type: none"> <li>○ស្ថានីយបូមទឹកនៅ និងការងារបន្ទាប់បន្សំ តូចជាងជម្រើស 2។</li> <li>○ហានិភ័យមានទឹកជំនន់ គិច និង កំពស់ដីត្រូវលុបបំបាញ់ទាប។</li> <li>▲បំពង់នាំទឹកនៅ វែង (8.3 គម)។</li> </ul>	<ul style="list-style-type: none"> <li>▲ស្ថានីយបូមទឹកនៅ និងការងារបន្ទាប់បន្សំ ធំជាងជម្រើស 1។</li> <li>▲ដោយសារទីតាំង WTP នៅក្នុងតំបន់ងាយជន់លិចចាំបាច់ត្រូវលើកនីវ៉ូដី (ប្រហែល 2 ម នាឆ្នាំ 1996 និង 2006)។</li> <li>○បំពង់នាំទឹកនៅ ខ្លីជាង (1.5 គម)។</li> </ul>
	ឧបករណ៍អេឡិចត្រូមេកានិច	▲កម្លាំងម៉ូទ័រខ្លាំង។ ថ្លៃប្រើថាមពលអគ្គិសនី ខ្ពស់ជាងជម្រើស 2។	○កម្លាំងម៉ូទ័រខ្សោយ។ ថ្លៃប្រើថាមពលអគ្គិសនី ទាបជាងជម្រើស 1។
ការដំណើរការ និងការថែទាំ		<ul style="list-style-type: none"> <li>○ការសម្អាត និងផ្លាស់ប្តូរគ្រឿងបន្លាស់ដែលខូចដោយសារកកខ្វះខាត មិនញឹកញាប់។</li> <li>▲ចម្ងាយរវាង WTP និងស្ថានីយបូមទឹកនៅ ឆ្ងាយ។</li> </ul>	<ul style="list-style-type: none"> <li>▲ការសម្អាត និងផ្លាស់ប្តូរគ្រឿងបន្លាស់ដែលខូចដោយសារកកខ្វះខាត ញឹកញាប់។</li> <li>○ងាយចេញចូលរវាង WTP និង ស្ថានីយបូមទឹកនៅ។</li> </ul>
តម្លៃ	JPY	<ul style="list-style-type: none"> <li>○Initial cost : 344,633 (thousand yen)</li> <li style="padding-left: 20px;">: 36,531(thousand yen/year)</li> <li>▲Running cost</li> <li style="padding-left: 20px;">: 24,616 (thousand yen/year)</li> </ul>	<ul style="list-style-type: none"> <li>▲Initial cost : 423,067 (thousand yen)</li> <li style="padding-left: 20px;">: 44,845 (thousand yen/year)</li> <li>○Running cost</li> <li style="padding-left: 20px;">: 22,054 (thousand yen/year)</li> </ul>
	KHR	<ul style="list-style-type: none"> <li>○Initial cost : 12,135 (million riel)</li> <li style="padding-left: 20px;">: 1,286(million riel/year)</li> <li>▲Running cost : 867 (million riel /year)</li> </ul>	<ul style="list-style-type: none"> <li>▲Initial cost : 14,897 (million riel)</li> <li style="padding-left: 20px;">: 1,579 (million riel/year)</li> <li>○Running cost : 777 (million riel/year)</li> </ul>

**ឧបសម្ព័ន្ធ 7.4**

**ការគណនាបំពង់នាំទឹកសៅ**  
**Hydraulic Calculation for Conveyance Pipe**

### 1. ការគណនាបណ្តាញបំពង់នាំទឹកនៅ

អង្កត់ផ្ចិតនៃបំពង់នាំទឹកនៅ នឹងមានទំហំ 350មម តាមលទ្ធផលគណនាដែលមានបង្ហាញដូចខាងក្រោម និងដែលពិចារណាអំពីទំនាក់ទំនងសេដ្ឋកិច្ច រវាងល្បឿនទឹកក្នុងបំពង់ដែលសមស្រប សម្អាត បាត់បង់/កំពស់សម្ពាធរបស់ម៉ាស៊ីនបូមដ៏ត្រឹមត្រូវ និងអង្កត់ផ្ចិតបំពង់។

រូបមន្តគណនា គឺប្រើរូបមន្ត Hazen-Williams ៖

$$H = 10.666 \times C^{-1.85} \times D^{-4.87} \times Q^{1.85} \times L$$

ដែល

H: សម្ពាធបាត់បង់ដោយកម្លាំងកកិត Friction Head Loss (m)

C: មេគុណល្បឿនទឹក Velocity coefficient: 110

D: អង្កត់ផ្ចិតសាច់ក្នុងបំពង់ Internal diameter of pipe (m)

Q: ធារទឹក (m<sup>3</sup>/s): ធារទឹកសម្រាប់គណនាបំពង់នាំទឹកនៅ គឺ 7,260 m<sup>3</sup>/day = 5.042m<sup>3</sup>/min = 0.0840m<sup>3</sup>/s

L: ប្រវែងបំពង់ (m): 8,320m

តារាង 1 បង្ហាញលទ្ធផលគណនានៃអង្កត់ផ្ចិតបំពង់នីមួយៗ ល្បឿនទឹកក្នុងបំពង់នាំទឹកនៅ ត្រូវតែយ៉ាងហោចណាស់ 0.3 ម/វិនាទី ឬលើសហ្នឹង ដើម្បីទប់ស្កាត់ការកកស្ទះបំពង់ដោយសារភាពល្អក់។ ល្បឿនដែលមានលក្ខណៈសន្សំសំចៃ ជាទូទៅប្រហែល 1 ម/វិនាទី។ សម្ពាធបាត់បង់ក្នុងបំពង់ទំហំ 300 មម មានកម្រិតខ្ពស់ គឺ 53.5 ម ហើយវានឹងពិបាកដោះស្រាយបញ្ហាបរិមាណទឹកដែលអាចប្រឈមនាពេលអនាគត។ កម្រិតខុសគ្នារវាងសម្ពាធបាត់បង់ក្នុងបំពង់ 350 មម និង 400 មម មិនជាប់ពាក់ព័ន្ធនឹងលក្ខណៈបច្ចេកទេស (pump specification) នៃម៉ាស៊ីនបូមឡើយ។ ដូច្នេះ បំពង់អង្កត់ផ្ចិត 350 មម ជាទំហំដែលសន្សំសំចៃបំផុត។

**តារាង 1 លទ្ធផលគណនាបណ្តាញទៅតាមទំហំបំពង់នីមួយៗ**

Flow rate (m <sup>3</sup> /s) Q	Diameter (mm) D	Length (m) L	Velocity coefficient C	Velocity (m/s) V	Hydraulic gradient I	Loss head (m) H=Lxh	Remarks
0.0840	Φ700	8,320	110	0.22	0.00010	0.83	
	Φ600			0.30	0.00022	1.83	
	Φ500			0.43	0.00053	4.41	
	Φ450			0.53	0.00089	7.40	
	Φ400			0.67	0.00158	13.15	
	<b>Φ350</b>			<b>0.88</b>	<b>0.00303</b>	<b>25.21</b>	<b>Recommendable</b>
	Φ300			1.20	0.00643	53.50	
	Φ250			1.72	0.01562	129.96	
Φ200	2.69	0.04630	385.22				

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**ឧបសម្ព័ន្ធ 7.5**

**ការជ្រើសរើសសម្ភារៈបំពង់**  
**Selection of Pipe Material**

**1. ការជ្រើសរើសសម្ភារៈបំពង់**

យោងតាម តារាង 2 ប្រភេទបំពង់ដែលអាចប្រើបាន នឹងមានដូចខាងក្រោម៖

បំពង់នាំទឹកទៅ

- កប់ក្នុងដីទូទៅ៖  $\phi$ 350មម, Ductile cast iron pipe (DIP) (ISO standard, push-on joint)
- ទីតាំងឆ្លងស្ទឹង៖  $\phi$ 350មម, បំពង់ដែក (មានស្រទាប់ការពារច្រេះចាប់)

បំពង់ចែកចាយ

- កប់ក្នុងដីទូទៅ៖  $\phi$ 250 ឬធំជាងហ្នឹង, Ductile cast iron pipe (DIP) (ISO standard, push-on joint)  
/  $\phi$ 200មម ឬតូចជាងហ្នឹង, High density polyethylene (HDPE) (PN10)
- ទីតាំងឆ្លងស្ទឹង៖ គ្រប់អង្កត់ផ្ចិត, បំពង់ដែក (មានស្រទាប់ការពារច្រេះចាប់)

**តារាង 2 ការប្រៀបធៀបសម្ភារៈបំពង់**

សម្ភារៈបំពង់	High density polyethylene (HDPE)	Ductile cast iron pipe (DIP)	បំពង់ដែក (SP)
ប្រវត្តិប្រើពីមុន	<ul style="list-style-type: none"> <li>• នៅប្រទេសកម្ពុជា មានប្រវត្តិប្រើដែលមានអង្កត់ផ្ចិត 200មម ឬតូចជាងនេះច្រើន នឹងតិចតួចចំពោះទំហំ 250មម ឬធំជាងហ្នឹង។</li> </ul>	<ul style="list-style-type: none"> <li>• នៅកម្ពុជា មានប្រវត្តិប្រើច្រើនចំពោះទំហំ 250មម ឬធំជាងនេះ</li> </ul>	<ul style="list-style-type: none"> <li>• មានប្រវត្តិចិត្តតូចប្រើកប់ក្នុងដី។ ប្រភេទនេះ ប្រើច្រើនពេលឆ្លងស្ទឹងតាមចំហៀងស្ពាន។</li> </ul>
គុណភាព	<ul style="list-style-type: none"> <li>• មាំតិចជាងប្រភេទលោហៈ</li> <li>• ប្រឈមនឹងច្រេះចាប់បានល្អណាស់</li> <li>• មិនធន់នឹងកម្ដៅ និងការស្លៀក UV</li> <li>• ត្រូវការប្រយ័ត្នប្រយែងជាមួយសារធាតុរំលាយ organic solvents។</li> <li>• អាចអុីកដោយកម្ដៅអគ្គិសនី (Electrofusion welding) និងម៉ាធន់និងរញ្ជួយដី។</li> </ul>	<ul style="list-style-type: none"> <li>• ត្រូវបំពង់មាំ ភាពអាចហូតបានខ្ពស់ និងអាចធន់នឹងកម្ដៅបំផ្លាញខ្លាំងបាន។</li> <li>• ប្រើបានយូរ</li> <li>• Push-on joints មិនធន់នឹងកម្ដៅរញ្ជួយដី ដូចកំណាត់រូប ឬអុីកដោយកម្ដៅអគ្គិសនីទេ។</li> </ul>	<ul style="list-style-type: none"> <li>• ត្រូវបំពង់មាំ ភាពអាចហូតបានខ្ពស់ និងអាចធន់នឹងកម្ដៅបំផ្លាញខ្លាំងបាន។</li> <li>• ប្រើបានយូរ</li> <li>• ត្រូវការការពារនឹងច្រេះចាប់ដោយបាតុភូតអេឡិចត្រូលីត។</li> <li>• ងាយច្រេះចាប់ប្រសិនបើស្រទាប់ការពារនៅផ្ទៃខាងក្នុង ឬខាងក្រៅខូច។</li> <li>• អាចផ្សារបាន និងធន់នឹងកម្ដៅរញ្ជួយដី។</li> </ul>
ភាពងាយស្រួលប្រើ	<ul style="list-style-type: none"> <li>• ងាយលើកដាក់ដោយសារទំងន់ស្រាល។</li> <li>• ដំឡើងបំពង់ពេលមានភ្លៀង ឬមានទឹកជ្រាបចេញ មានការពិបាក។</li> <li>• ត្រូវការឧបករណ៍ពិសេសដើម្បីត្រួតពិនិត្យ ករណីអុីកដោយកម្ដៅអគ្គិសនី។</li> </ul>	<ul style="list-style-type: none"> <li>• Push-on joints ងាយធ្វើការ។</li> <li>• ធ្ងន់</li> <li>• ចាំបាច់ការពារតំណពិសេស។</li> </ul>	<ul style="list-style-type: none"> <li>• ងាយដំឡើង ទោះបីរត់បំពង់សំបកក៏អាចទៅរួច។</li> <li>• កំណាត់រូបពិបាកភ្ជាប់ និងមានការបាត់បង់ពីគុណភាពមិនល្អ។</li> <li>• ចាំបាច់ត្រូវមានស្រទាប់ការពារប្រឆាំងនឹងច្រេះចាប់។</li> </ul>
ភាពងាយស្រួលថែទាំ	<ul style="list-style-type: none"> <li>• ចំពោះអង្កត់ផ្ចិតតូចជាង ឬស្មើ 200 មម គេអាចជួសជុល ។ល។ តាមវិធីដែលមានពីមុន។</li> <li>• មានការលំបាកធ្វើលទ្ធកម្មបំពង់ និងគ្រឿងតំណ ចំពោះអង្កត់ផ្ចិតធំជាងឬស្មើ 250 មម ហើយការដំឡើងអាចយឺត។</li> </ul>	<ul style="list-style-type: none"> <li>• អាចជួសជុលបំពង់អង្កត់ផ្ចិតធំជាង 250 មម តាមវិធីដែលមានពីមុន។</li> </ul>	<ul style="list-style-type: none"> <li>• គេចាត់ទុកថាមានការចំណាយពេលច្រើន ពីព្រោះចាំបាច់ត្រូវការបច្ចេកទេសដំឡើងវា។</li> </ul>
តម្លៃសាងសង់	<ul style="list-style-type: none"> <li>• មិនថ្លៃ</li> </ul>	<ul style="list-style-type: none"> <li>• ថ្លៃក្នុងកម្រិតមួយ</li> </ul>	<ul style="list-style-type: none"> <li>• ថ្លៃក្នុងកម្រិតមួយ</li> </ul>

ប្រភព៖ ក្រុមសិក្សា JICA



**ឧបសម្ព័ន្ធ 7.6**

**ទីតាំង និងជម្រៅដាក់បំពង់នាំទឹកនៅ និងបំពង់មេចែកចាយទឹកស្អាត**  
**Location and Depth of Laying for Conveyance Pipe and Distribution**  
**Mains**

**1. ទីតាំង និងជម្រៅបំពង់នាំទឹកនៅ និងបំពង់មេចែកចាយទឹកស្អាត**

ស្ថានភាពប្រើប្រាស់ផ្លូវ និងព័ត៌មានផ្សេងៗ បានប្រមូលពីមន្ទីរសាធារណការនិងដឹកជញ្ជូន (DPWT) ។

ជាទូទៅ ផ្លូវនៅប្រទេសកម្ពុជា គ្រប់គ្រងដោយក្រសួងសាធារណការនិងដឹកជញ្ជូន (MPWT) និង ផ្លូវជនបទ គ្រប់គ្រងដោយក្រសួងអភិវឌ្ឍន៍ជនបទ (MRD)។

**1-1 ទីតាំងបំពង់ / ជម្រៅលើខ្នងបំពង់**

MPWT មានចែងពីលក្ខខណ្ឌប្រើប្រាស់ផ្លូវ នៃបណ្តាញសាធារណៈនានា និងសំណង់សេវាផ្សេងៗ (ខ្សែកាបអុបទ្វីច បណ្តាញទឹកស្អាត ។ល។) តាមប្រភេទនីមួយៗដូចខាងក្រោម។

- ផ្លូវជាតិដែលមានលេខមួយខ្ទង់ (ក្នុងរវាង 5 ម ចេញពីចុង 30 ម ពីអ័ក្សផ្លូវ) គ្រប់គ្រងដោយក្រសួងសាធារណការ (MPWT)
- ផ្លូវជាតិដែលមានលេខពីរខ្ទង់ (ក្នុងរវាង 5 ម ចេញពីចុង 25 ម ពីអ័ក្សផ្លូវ) គ្រប់គ្រងដោយក្រសួងសាធារណការ (MPWT)
- ផ្លូវជាតិដែលមានលេខបីខ្ទង់ (ក្នុងរវាង 5 ម ចេញពីចុង 20 ម ពីអ័ក្សផ្លូវ) គ្រប់គ្រងដោយក្រសួងសាធារណការ (MPWT)
- ផ្លូវជនបទ ក្នុងរវាង 5 ម ចេញពីចុង 15 ម ពីអ័ក្សផ្លូវ) គ្រប់គ្រងដោយក្រសួងអភិវឌ្ឍន៍ជនបទ (MRD)
- ផ្លូវភូមិ (អាស្រ័យលើស្ថានភាពជាក់ស្តែង)

ពិបាកអនុវត្តតាមលក្ខខណ្ឌនេះ បំពង់អាចដំឡើងនៅក្រោមជ្រុងផ្លូវ (road shoulder)។ ជម្រៅលើខ្នងបំពង់ ពី 0.5 ដល់ 1 ម ផ្ទៃផ្លូវខាងលើ។ ករណីបំពង់ឆ្លងកាត់ផ្លូវជាតិដែលមានលេខមួយខ្ទង់ ចាំបាច់ប្រើវិធីមិនជីកកាត់ផ្លូវ និងចាំបាច់ស្នើសុំការអនុញ្ញាតពី MPWT។

**1-2 រចនាសម្ព័ន្ធផ្លូវ / សមាសភាពផ្លូវ, ការជួសជុលផ្លូវ**

ឧទាហរណ៍នៃស្តង់ដាររចនាសម្ព័ន្ធផ្លូវ និងរចនាសម្ព័ន្ធក្រាលស្រទាប់ផ្លូវ មានបង្ហាញក្នុង រូប 1 និង រូប 2។ ការជួសជុលស្រទាប់ផ្លូវ ត្រូវមានចម្ងាយ 0.5 ម សងខាងពីអ័ក្សបំពង់។

**1-3 លទ្ធភាពដំឡើងបំពង់ទឹកតាមចំហៀងស្ពាន**

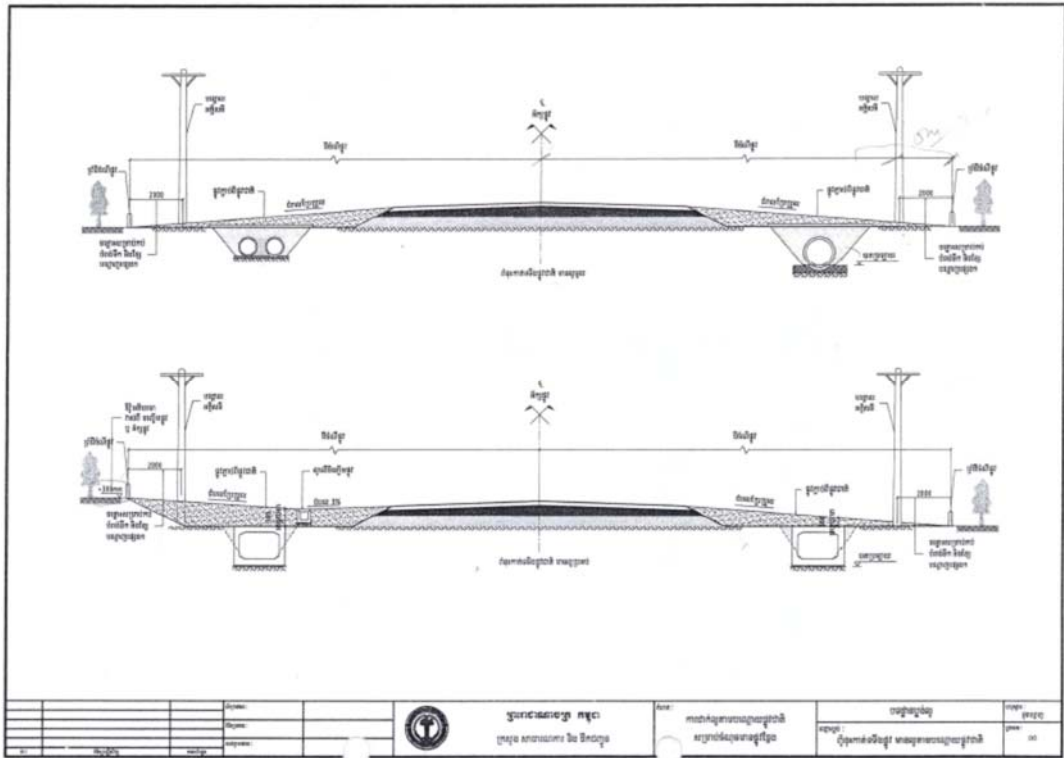
ទោះបីជា គ្មានបញ្ហាអ្វីដល់ស្ពានក្នុងការដាក់បន្តកដោយបំពង់ទឹករហូតដល់ទំហំ 500 មម ក៏ដោយ ក៏ចាំបាច់ត្រូវស្នើសុំការអនុញ្ញាតពី MPWT ចំពោះផ្លូវជាតិដែលមានលេខមួយខ្ទង់។ ចាំបាច់ត្រូវផ្តល់ដំណឹងដល់ DPWT ចំពោះផ្លូវជាតិដែលមានលេខបីខ្ទង់ និងដល់ MRD ចំពោះផ្លូវជនបទនិងផ្លូវភូមិ។ ជាទូទៅ ត្រូវការរយៈពេលប្រហែលមួយខែ ដើម្បីបានការអនុញ្ញាតពី MPWT។

**1-4 បំពង់ឆ្លងកាត់ផ្លូវដែក**

ពេលបំពង់កាត់ផ្លូវដែក ចាំបាច់ដំឡើងវាដោយវិធីមិនដឹកកាត់ (ដេប្រោលើខ្នងបំពង់ 1.5 ដល់ 2 ម, មានបំពង់ស្រោបការពារ ។ល។) និងចាំបាច់ស្នើសុំការអនុញ្ញាតជាផ្លូវការពី MPWT។

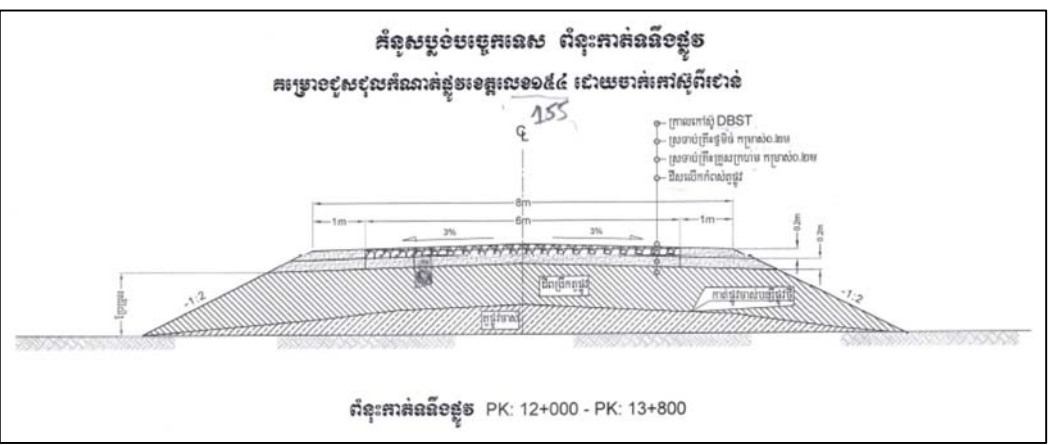
**1-5 គម្រោងពាក់ព័ន្ធនាពេលអនាគត**

មិនមានផែនការជាក់ស្តែងអំពីផ្លូវដែលត្រូវរចនា។ ទោះបីជាមានពាក្យថាមានផែនការជួសជុលផ្លូវដែកដែលមិនដំណើរការ ក៏ពិតមានលំអិត មិនត្រូវគេដឹងឡើយ។



ប្រភព៖ DPWT

**រូប 1 ឧទាហរណ៍នៃលក្ខខណ្ឌប្រើប្រាស់ផ្លូវ**



ប្រភព៖ DPWT

**រូប 2 ឧទាហរណ៍នៃស្តង់ដាររចនាសម្ព័ន្ធផ្លូវ និងរចនាសម្ព័ន្ធស្រទាប់ផ្លូវ**

**ឧបសម្ព័ន្ធ 7.7**

**ការកំណត់មេគុណម៉ោង ដើម្បីគណនាបរិមាណធារទឹកចែកចាយតាម  
ម៉ោងអតិបរមា ក្នុងគម្រោង**  
**Setting Time Coefficient For Calculating Design Maximum Hourly  
Distribution Flow**

**1. ការកំណត់មេគុណម៉ោងដើម្បីគណនាទឹកចែកចាយអតិបរមាតាមម៉ោង**

យោងតាមទិន្នន័យចែកចាយទឹកអតិបរមា បីថ្ងៃ ដែលវាស់ដោយប្រព័ន្ធតាមដានការចែកចាយទឹក ស្អាតដែលមានស្រាប់ ដូចមានបង្ហាញក្នុង តារាង 3 គេឃើញថាមេគុណម៉ោងអតិបរមា គឺប្រហែល 1.30។ ដូចមានបង្ហាញក្នុង តារាង 4 មេគុណម៉ោងនៅក្នុងគម្រោងក្រុងដែលមានទំហំស្រដៀងគ្នា (គម្រោង ជំនួយឥតសំណងជប៉ុន) ត្រូវបានកំណត់ប្រហែល 1.70។

តាមគុណខណ្ឌលើ និងដោយគិតអំពីការពង្រីកប្រព័ន្ធនាពេលអនាគត ក៏ដូចជាលទ្ធផលពិភាក្សា ជាមួយ MIH មេគុណម៉ោងអតិបរមា នឹងត្រូវកំណត់ 1.30 នៅក្នុងគម្រោងនេះ។

**តារាង 3 ទឹកក្នុងមួយម៉ោង ក្នុងថ្ងៃដែលមានការផ្គត់ផ្គង់ទឹកអតិបរមាក្នុងតំបន់សេវាដែលមានស្រាប់ ក្នុងក្រុងពោធិ៍សាត់**

Time	7th July 2015		7th March 2015		28th February 2015	
	(A) Flow per hour (m <sup>3</sup> )	(A)/(C)	(A) Flow per hour (m <sup>3</sup> )	(A)/(C)	(A) Flow per hour (m <sup>3</sup> )	(A)/(C)
1:00	216	0.79	153	0.58	166	0.65
2:00	210	0.77	147	0.56	159	0.62
3:00	209	0.76	146	0.56	155	0.60
4:00	211	0.77	146	0.56	157	0.61
5:00	221	0.81	166	0.63	169	0.66
6:00	272	0.99	236	0.90	219	0.85
7:00	322	1.18	313	1.19	314	1.22
8:00	318	1.16	329	1.26	328	1.28
9:00	309	1.13	321	1.23	312	1.21
10:00	301	1.10	311	1.19	302	1.18
11:00	302	1.10	311	1.19	300	1.17
12:00	301	1.10	312	1.19	305	1.19
13:00	297	1.08	302	1.15	296	1.15
14:00	291	1.06	299	1.14	294	1.14
15:00	289	1.05	294	1.12	292	1.14
16:00	292	1.07	299	1.14	288	1.12
17:00	290	1.06	298	1.14	304	1.18
18:00	303	1.11	321	1.23	314	1.22
19:00	308	1.12	319	1.22	306	1.19
20:00	307	1.12	292	1.11	292	1.14
21:00	290	1.06	268	1.02	275	1.07
22:00	268	0.98	249	0.95	251	0.98
23:00	240	0.88	233	0.89	195	0.76
24:00	219	0.80	219	0.84	168	0.65
(B) Daily distribution flow	6,586	-	6,284	-	6,161	-
(C) Average hourly distribution flow	274	-	262	-	257	-

សម្គាល់៖ ថ្ងៃទាំងបី ដែលមានកំណត់គ្រាបរិមាណផ្គត់ផ្គង់ទឹកអតិបរមា ក្នុងឆ្នាំ 2015។ បន្ទាប់ពីឆ្នាំ 2016 មិនមានកំណត់គ្រា ដោយសារប្រព័ន្ធយប់ដំណើរការ។  
ប្រភព៖ ក្រុមសិក្សា JICA

**តារាង 4 មេគុណម៉ោងក្នុងគម្រោងនាក្រុងផ្សេងៗ ក្នុងប្រទេសកម្ពុជា**

Item	Kampong Cham	Battambang	Kampot
Design maximum daily distribution flow	16,200 m <sup>3</sup> /day	32,473 m <sup>3</sup> /day	13,260 m <sup>3</sup> /day
Time coefficient	1.72	1.65	1.75

**ឧបសម្ព័ន្ធ 7.8**

**សមត្ថភាពអាងស្តុកទឹកស្អាត**

**Capacity of the service reservoir**

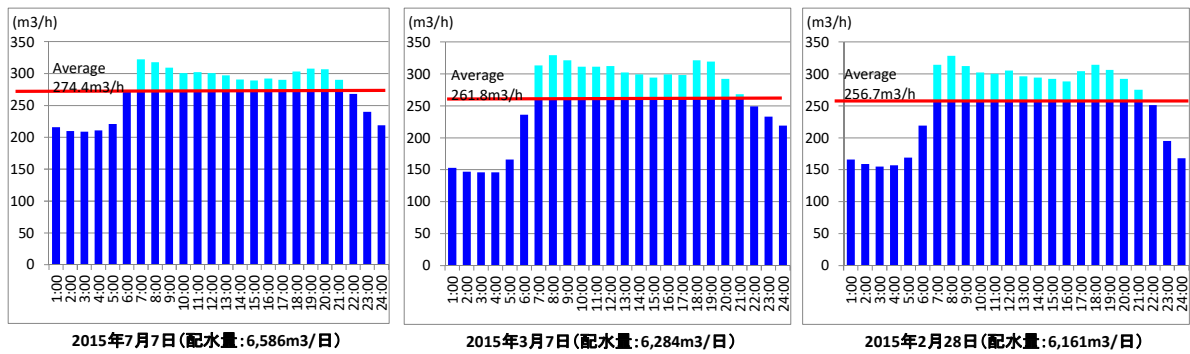
### 1. សមត្ថភាពអាងស្តុកទឹកស្អាត

អាងស្តុកទឹកស្អាត ចាំបាច់ត្រូវមាន ដើម្បីកែសម្រួលបម្រែបម្រួលនៃបរិមាណទឹកចែកចាយ ជាមួយនឹង បរិមាណទឹកបញ្ជូន និងលើសពីនេះទៀត វាត្រូវមានសមត្ថភាពផ្គត់ផ្គង់ទឹកឲ្យបានរយៈពេលមួយ ក្នុងពេល មានអាសន្ន។

សមត្ថភាពអាងស្តុកទឹកដែលមានស្រាប់ (ជាផ្លូវការ 2,000 ម<sup>3</sup>) អាចផ្គត់ផ្គង់ទឹកបាន 7.3 ម៉ោង នូវបរិមាណ ទឹកផ្គត់ផ្គង់ប្រចាំថ្ងៃអតិបរមាអតិកាល (6,586 ម<sup>3</sup>/ថ្ងៃ)។ ដូចមានបង្ហាញក្នុងរូបខាងក្រោម បរិមាណទឹក ចាំបាច់សម្រាប់កែសម្រួលបម្រែបម្រួលតម្រូវការទឹក គឺពី 410 ដល់ 670 ម<sup>3</sup> (ផ្នែកពណ៌ផ្ទៃមេឃក្នុងរូបខាង ក្រោម ជាបរិមាណទឹកសរុប ដែលបរិមាណទឹកចែកចាយក្នុងមួយម៉ោងនាថ្ងៃផ្គត់ផ្គង់អតិបរមា លើស បរិមាណទឹកចែកចាយក្នុងមួយម៉ោងគិតជាមធ្យម) និងមានកម្រិតស្ទើរនឹង 2.6 ម៉ោង នៃបរិមាណទឹក ផ្គត់ផ្គង់អតិបរមា។

លើសពីនេះ ត្រូវចាំបាច់ពិចារណាអំពីបរិមាណទឹកចាំបាច់សម្រាប់ដោះស្រាយពេលមានអាសន្ន ដែលកើត ឡើងនៅផ្នែកមុនអាងស្តុកទឹក (រាំងស្ងួត មានការបំពុលទឹក បរិក្ខាខូច ។ល។) និងតម្រូវការនៅផ្នែកបន្ទាប់ ពីអាងស្តុក (ទឹកពន្លត់អគ្គិភ័យ បរិក្ខាខូច ។ល។) ម្យ៉ាងទៀត ក្នុងគម្រោងនៅក្រុងដែលមានទំហំស្រដៀង គ្នា (គម្រោងជំនួយឥតសំណង) ដូចមានបង្ហាញក្នុង តារាង 5 សមត្ថភាពអាងស្តុក គឺពី 3.5 ដល់ 6.5 ម៉ោង ។

ផ្អែកលើការរៀបរាប់ខាងលើ និងលើលទ្ធផលពិភាក្សាជាមួយ MIH សមត្ថភាពអាងស្តុកទឹក នឹងត្រូវអាច ផ្គត់ផ្គង់ទឹកបាន 8 ម៉ោងនៃបរិមាណទឹកផ្គត់ផ្គង់ប្រចាំថ្ងៃអតិបរមាក្នុងតំបន់សេវា ដែលស្ទើរនឹង 2,200 ម<sup>3</sup> (6,600 ម<sup>3</sup> × 8/24) ដើម្បីធានាការផ្គត់ផ្គង់ទឹកស្អាតឲ្យមានស្ថេរភាពគ្រប់ពេល រួមទាំងពេលអាសន្នផងដែរ។  
សំគាល់៖ ថ្ងៃទាំងបីដែលបានកត់ត្រាបរិមាណទឹកផ្គត់ផ្គង់ប្រចាំថ្ងៃអតិបរមា នាឆ្នាំ 2015។ មិនមានកំណត់ត្រាទៀតឡើយបន្ទាប់ពីឆ្នាំ 2016



ដោយសារប្រព័ន្ធកាមងារនៃការផ្គត់ផ្គង់ទឹក ខូច។  
ប្រភព៖ ក្រុមសិក្សា JICA

រូប 3 ធារទឹកក្នុងមួយម៉ោងក្នុងតំបន់ផ្គត់ផ្គង់សេវានៃក្រុងពោធិសាត់ (ផ្គត់ផ្គង់ប្រចាំថ្ងៃអតិបរមា)

តារាង 5 សមត្ថភាពអាងស្តុកទឹក រចនាក្នុងក្រុងផ្សេងៗនៃប្រទេសកម្ពុជា

Item	កំពង់ចាម	បាត់ដំបង	កំពត
Design maximum daily distribution flow	16,200 ម <sup>3</sup> /ថ្ងៃ	32,473 ម <sup>3</sup> /ថ្ងៃ	13,260 ម <sup>3</sup> /ថ្ងៃ
Service reservoir capacity	5.2 ម៉ោង	6.5 ម៉ោង	3.5 ម៉ោង

**ឧបសម្ព័ន្ធ 7.9**

**ការគណនាបណ្តាញបំពង់ទឹក**

**Hydraulic Network Analysis**



### 1. ការគណនាបណ្តាញទឹក

ការគណនាបណ្តាញទឹក ធ្វើឡើងក្នុងកម្មវិធី EPANET ver 2.0 ក្រោមលក្ខខណ្ឌដូចខាងក្រោម៖

រូបមន្តធារទឹក៖ Hazen - Williams formula

មេគុណល្បឿនទឹក (មេគុណកាតិក)៖ 110

សម្ពាធទឹកទាបបំផុតក្នុងបណ្តាញ៖

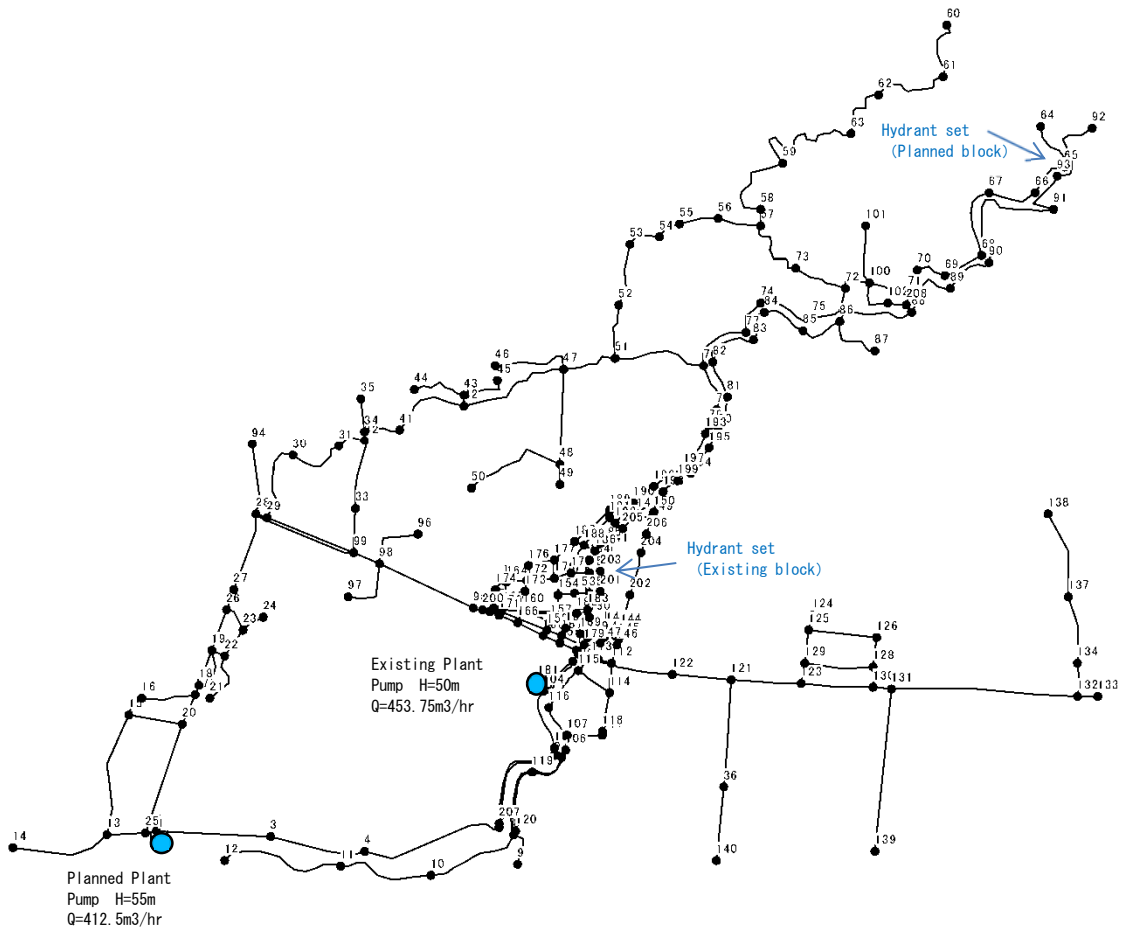
- 50 kPa ឬលើសហ្នឹង ចំពោះធារទឹកចែកចាយតាមម៉ោងអតិបរមាក្នុងការរចនា
- 0 kPa ឬលើសហ្នឹង (សម្ពាធមិនអាចអវិជ្ជមានបានឡើយ) ចំពោះពេលមានអគ្គិភ័យ ដែលធារទឹកក្នុងការរចនា គឺ ធារទឹកចែកចាយតាមម៉ោងជាមធ្យម ឬកន្លះធារទឹកពន្លត់អគ្គិភ័យ

មេគុណម៉ោងអតិបរមា៖ 1.30

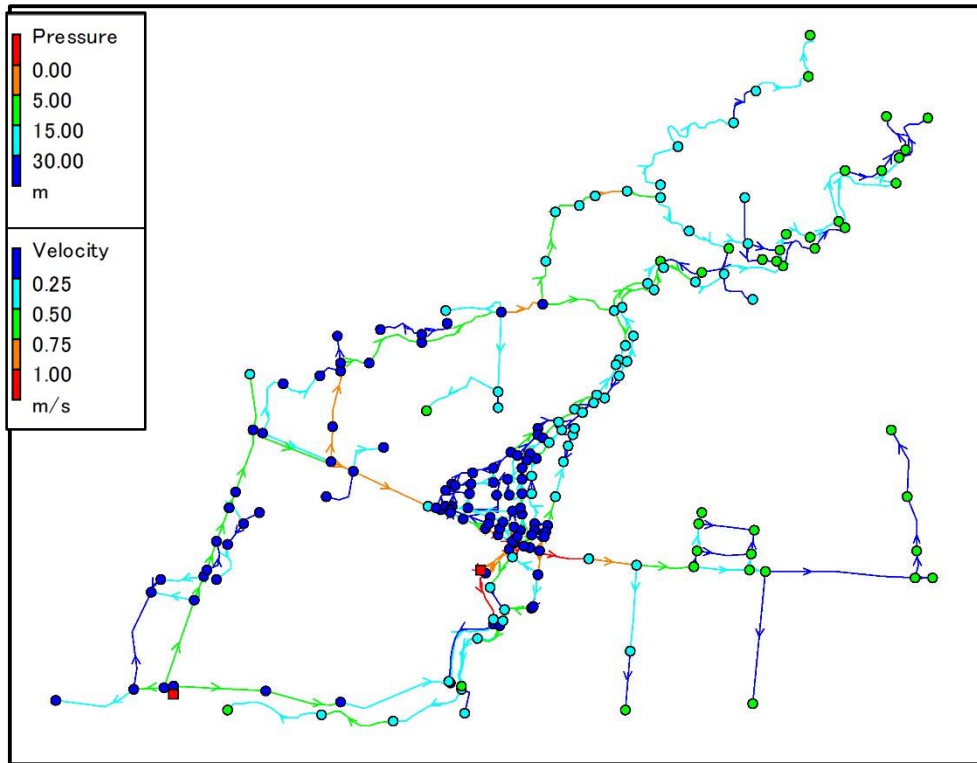
លក្ខខណ្ឌពេលមានអគ្គិភ័យ៖

- កំណត់យកធារទឹកពន្លត់អគ្គិភ័យស្មើនឹង 0.5ម<sup>3</sup>/នាទី សម្រាប់វានអគ្គិភ័យ ដែលមានមាត់តែមួយ ដែលដំឡើងចំទីតាំងដែលមានស្ថានភាពអាក្រក់បំផុត ពេលមានអគ្គិភ័យ។

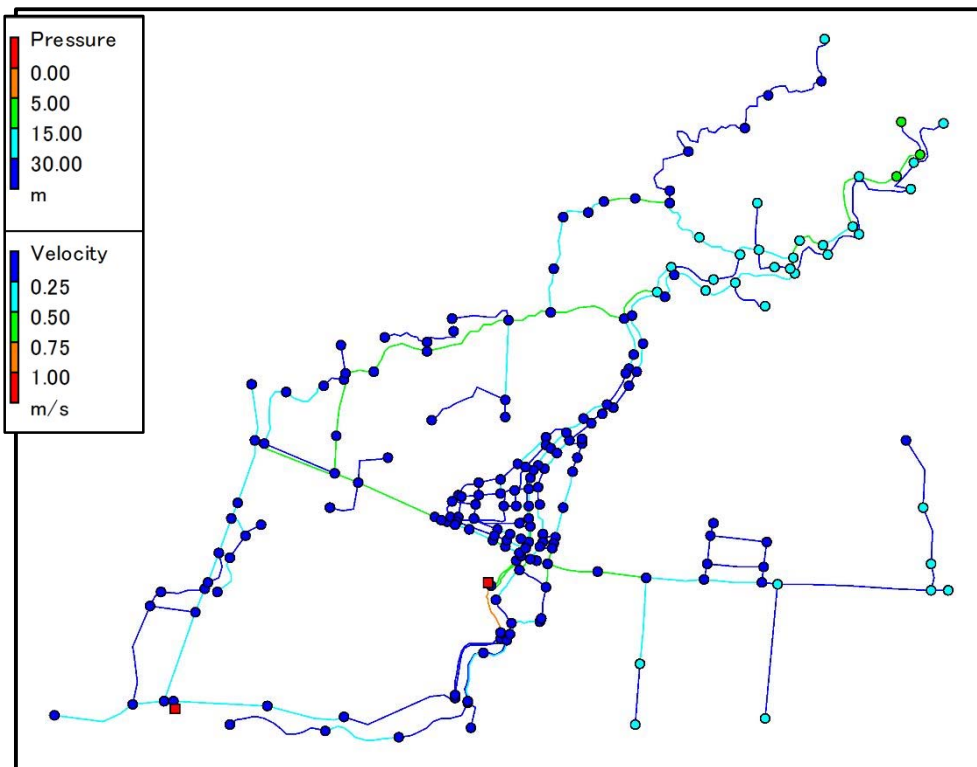
ការគណនាបណ្តាញនេះ ធ្វើឡើងចំពោះតំបន់ដែលចែកចាយដោយ WTP ដែលមានស្រាប់ និងចំពោះតំបន់ដែលចែកចាយដោយ WTP ថ្មី។ ម៉ូដែលគណនា និងលទ្ធផលមានបង្ហាញដូចខាងក្រោម។



រូប 4 ម៉ូដែលគណនាបណ្តាញ



រូប 5 លទ្ធផលគណនាបណ្តាញ ចំពោះការទឹកចែកចាយប្រចាំម៉ោងអតិបរមា



រូប 6 លទ្ធផលគណនាបណ្តាញ ពេលមានអគ្គិភ័យ

ព័ត៌មានគណនា និងលទ្ធផល (Junctions) -1

NodeID	Elevation m	Peak Demand		Extinction Demand	
		Demand LPS	Pressure m	Demand LPS	Pressure m
Junc2	18.2	0.00	49.59	0.00	49.68
Junc3	17.8	1.22	42.77	0.81	46.67
Junc4	17.6	2.91	38.05	1.94	44.55
Junc5	17.1	0.00	34.86	0.00	43.31
Junc6	17.9	0.00	31.28	0.00	41.20
Junc7	17.9	0.00	31.07	0.00	41.10
Junc8	17.2	0.00	28.89	0.00	40.44
Junc9	17.0	0.00	29.09	0.00	40.64
Junc10	17.5	2.30	26.07	1.53	38.95
Junc11	17.3	2.63	18.39	1.75	35.43
Junc12	17.5	1.61	11.11	1.07	31.89
Junc13	19.8	1.50	44.62	1.00	46.41
Junc14	20.0	1.88	36.81	1.25	42.62
Junc15	16.6	2.01	45.58	1.34	48.39
Junc16	16.6	0.81	45.75	0.54	48.46
Junc17	16.7	0.00	48.00	0.00	49.38
Junc18	16.9	0.00	47.64	0.00	49.08
Junc19	16.6	0.00	47.25	0.00	48.97
Junc20	17.4	0.00	47.91	0.00	49.03
Junc21	16.0	0.75	38.33	0.50	45.04
Junc22	15.9	0.72	43.54	0.48	47.55
Junc23	15.9	0.75	43.62	0.50	47.58
Junc24	15.5	0.00	44.02	0.00	47.98
Junc25	18.6	0.00	48.92	0.00	49.12
Junc26	16.5	0.00	46.54	0.00	48.60
Junc27	15.5	0.00	47.16	0.00	49.37
Junc28	17.1	0.00	44.15	0.00	46.94
Junc29	17.7	2.04	42.75	1.36	45.88
Junc30	15.5	0.51	41.10	0.34	45.76
Junc31	15.0	2.25	39.61	1.50	45.01
Junc32	14.5	0.00	40.08	0.00	45.45
Junc33	14.7	0.75	42.32	0.50	46.78
Junc34	14.7	0.00	39.56	0.00	45.05
Junc35	14.2	2.37	39.93	1.58	45.49
Junc36	18.5	1.50	8.36	1.00	28.37
Junc41	14.7	0.00	38.33	0.00	44.26
Junc42	13.6	0.00	36.62	0.00	43.56
Junc43	13.5	1.50	35.48	1.00	43.08
Junc44	13.5	0.48	32.99	0.32	41.91
Junc45	13.5	0.48	33.50	0.32	42.15
Junc46	14.0	1.51	28.62	1.01	38.97
Junc47	14.0	3.00	32.70	2.00	40.89
Junc48	13.9	1.50	23.37	1.00	36.55
Junc49	14.0	0.00	23.27	0.00	36.45
Junc50	14.0	0.69	14.25	0.46	32.19
Junc51	13.5	0.00	30.17	0.00	39.38
Junc52	13.2	1.25	28.50	0.83	38.39
Junc53	13.3	0.00	26.32	0.00	36.92
Junc54	13.5	3.45	25.00	2.30	35.98
Junc55	13.3	1.14	24.53	0.76	35.71
Junc56	13.5	1.61	21.54	1.07	33.56

ព័ត៌មានគណនា និងលទ្ធផល (Junctions) -2

NodeID	Elevation m	Peak Demand		Extinction Demand	
		Demand LPS	Pressure m	Demand LPS	Pressure m
Junc57	13.4	2.44	18.95	1.63	31.72
Junc58	13.1	0.00	18.89	0.00	31.85
Junc59	12.9	0.91	17.20	0.61	31.16
Junc60	12.1	1.19	11.81	0.79	29.04
Junc61	11.8	0.90	14.02	0.60	30.24
Junc62	11.9	0.72	15.72	0.48	30.99
Junc63	12.4	2.25	15.54	1.50	30.65
Junc64	12.9	1.50	10.13	1.00	12.10
Junc65	13.6	1.66	10.03	9.44	11.68
Junc66	13.9	0.00	10.02	0.00	13.96
Junc67	14.2	3.21	10.05	2.14	16.68
Junc68	12.9	4.50	13.17	3.00	24.39
Junc69	13.3	3.16	13.44	2.11	25.31
Junc70	13.3	0.00	14.29	0.00	26.61
Junc71	13.6	1.59	14.57	1.06	27.19
Junc72	14.5	4.57	14.60	3.05	27.72
Junc73	13.8	0.61	16.68	0.41	29.66
Junc74	14.4	4.49	14.22	2.99	27.87
Junc75	14.1	0.00	14.77	0.00	28.14
Junc76	14.8	0.00	25.21	0.00	35.60
Junc77	14.2	2.14	16.64	1.43	29.91
Junc78	15.0	2.33	23.78	1.55	34.57
Junc79	15.2	1.08	23.18	0.72	34.09
Junc80	16.6	0.87	21.57	0.58	32.54
Junc81	15.9	0.00	21.75	0.00	32.85
Junc82	15.8	1.93	21.28	1.29	32.52
Junc83	15.7	0.00	19.29	0.00	30.97
Junc84	15.6	0.00	18.09	0.00	30.05
Junc85	15.6	1.56	16.41	1.04	28.71
Junc86	15.1	1.73	15.60	1.15	28.14
Junc87	14.5	0.00	16.20	0.00	28.74
Junc88	14.6	1.29	14.05	0.86	26.84
Junc89	14.6	1.26	13.43	0.84	26.54
Junc90	15.2	0.00	12.59	0.00	25.83
Junc91	13.3	1.29	9.76	0.86	25.50
Junc92	13.0	0.74	6.75	0.49	24.24
Junc93	13.1	0.60	7.74	0.40	24.65
Junc94	16.1	1.20	28.96	0.80	40.30
Junc95	16.5	13.50	27.56	9.00	39.10
Junc96	14.5	1.20	38.24	0.80	45.20
Junc97	15.0	0.00	39.70	0.00	45.63
Junc98	16.8	1.10	37.90	0.73	43.83
Junc99	15.6	2.01	42.99	1.34	46.87
Junc100	13.7	1.08	15.10	0.72	28.07
Junc101	13.7	0.00	15.10	0.00	28.07
Junc102	14.0	0.00	14.63	0.00	27.47
Junc104	16.5	0.00	49.51	0.00	49.94
Junc105	17.9	0.00	25.45	0.00	37.53
Junc106	17.9	1.69	20.70	1.13	35.21
Junc107	16.9	2.80	18.85	1.87	34.49
Junc108	17.7	0.00	44.86	0.00	46.78

ព័ត៌មានគណនា និងលទ្ធផល (Junctions) -3

NodeID	Elevation m	Peak Demand		Extinction Demand	
		Demand LPS	Pressure m	Demand LPS	Pressure m
Junc109	17.8	0.00	40.68	0.00	44.36
Junc110	16.7	2.92	38.17	1.95	43.41
Junc111	18.2	0.00	35.41	0.00	41.30
Junc112	18.2	0.00	34.75	0.00	40.99
Junc113	18.2	0.00	32.39	0.00	39.83
Junc114	15.5	2.56	33.07	1.71	41.64
Junc115	17.7	5.34	27.97	3.56	38.07
Junc116	16.2	3.00	19.63	2.00	35.20
Junc117	15.4	0.00	31.68	0.00	41.06
Junc118	15.4	1.29	31.72	0.86	41.08
Junc119	16.9	1.20	15.70	0.80	33.38
Junc120	17.2	3.92	10.55	2.61	30.79
Junc121	16.4	3.15	16.67	2.10	33.40
Junc122	15.7	2.63	25.80	1.75	38.08
Junc123	16.2	0.00	13.03	0.00	31.79
Junc124	14.0	0.51	12.99	0.34	32.94
Junc125	14.5	1.50	13.23	1.00	32.79
Junc126	15.3	0.93	10.85	0.62	31.24
Junc128	15.8	1.14	10.60	0.76	30.86
Junc129	15.1	0.00	13.56	0.00	32.62
Junc130	16.9	0.00	10.26	0.00	30.11
Junc131	17.0	2.38	9.77	1.59	29.83
Junc132	19.6	0.30	6.72	0.20	27.02
Junc133	19.5	0.41	6.14	0.27	26.80
Junc134	17.8	0.00	8.29	0.00	28.71
Junc137	16.8	0.36	8.82	0.24	29.49
Junc138	15.6	0.75	9.73	0.50	30.55
Junc139	18.4	1.50	8.10	1.00	28.30
Junc140	18.5	1.89	7.17	1.26	27.81
Junc141	15.6	0.00	31.10	0.00	39.96
Junc142	15.6	0.00	32.06	0.00	40.83
Junc143	15.6	0.99	32.47	0.66	41.07
Junc144	14.8	0.00	32.55	0.00	41.51
Junc145	14.6	2.01	33.47	1.34	42.08
Junc146	14.9	0.00	34.31	0.00	42.37
Junc147	15.6	1.13	33.11	0.75	41.42
Junc148	16.2	0.75	26.33	0.50	37.55
Junc149	14.2	0.00	28.15	0.00	39.48
Junc150	14.2	0.00	28.15	0.00	39.48
Junc151	15.5	0.00	35.23	0.00	41.71
Junc152	16.0	0.00	35.09	0.00	41.50
Junc153	16.0	0.00	34.61	0.00	41.25
Junc154	15.0	5.94	35.26	3.96	42.09
Junc155	16.5	0.00	38.06	0.00	43.43
Junc156	16.4	0.00	35.50	0.00	42.00
Junc157	15.5	4.50	34.64	3.00	41.92
Junc158	16.0	3.49	34.24	2.33	41.50
Junc159	16.2	0.00	36.67	0.00	42.59
Junc160	16.3	3.35	33.48	2.23	40.80
Junc161	16.5	5.41	32.92	3.61	40.44
Junc162	15.5	0.00	33.86	0.00	41.32

ព័ត៌មានគណនា និងលទ្ធផល (Junctions) -4

NodeID	Elevation m	Peak Demand		Extinction Demand	
		Demand LPS	Pressure m	Demand LPS	Pressure m
Junc163	15.3	0.00	34.12	0.00	41.64
Junc164	15.5	3.00	33.45	2.00	41.15
Junc165	16.0	4.55	33.43	3.03	40.95
Junc166	16.5	0.00	33.75	0.00	40.92
Junc167	16.4	4.50	33.75	3.00	41.07
Junc168	15.6	4.50	35.10	3.00	42.11
Junc169	16.0	0.00	36.04	0.00	42.38
Junc170	16.0	0.00	33.62	0.00	41.06
Junc171	16.5	0.00	33.17	0.00	40.59
Junc172	16.0	4.50	33.08	3.00	40.68
Junc173	16.0	0.00	33.37	0.00	40.86
Junc174	15.3	0.00	34.08	0.00	41.56
Junc175	14.6	0.00	35.70	0.00	42.46
Junc176	16.2	3.13	33.10	2.09	40.52
Junc177	14.6	0.00	34.77	0.00	42.12
Junc178	14.6	3.82	35.80	2.55	42.50
Junc179	16.2	0.00	37.42	0.00	43.09
Junc180	16.2	0.00	35.78	0.00	41.96
Junc182	16.0	0.00	35.87	0.00	42.10
Junc183	16.2	0.00	35.66	0.00	41.88
Junc184	15.5	0.00	35.16	8.33	41.61
Junc185	16.0	0.00	32.92	0.00	40.44
Junc186	15.6	0.00	33.88	0.00	41.08
Junc187	14.1	0.00	35.22	0.00	42.55
Junc188	14.5	1.85	34.88	1.23	42.16
Junc189	14.1	3.22	31.06	2.15	40.58
Junc190	15.3	0.00	29.63	0.00	39.26
Junc191	15.0	0.00	34.09	0.00	41.52
Junc192	15.3	0.00	32.19	0.00	40.47
Junc193	15.0	2.40	22.04	1.60	35.84
Junc194	16.0	1.08	21.46	0.72	32.81
Junc195	15.9	1.15	21.78	0.77	33.01
Junc196	15.1	1.75	25.81	1.17	37.57
Junc197	14.9	1.68	23.39	1.12	36.53
Junc198	15.8	0.67	26.27	0.45	37.73
Junc199	15.8	0.91	26.19	0.61	37.69
Junc200	16.5	0.00	32.92	0.00	40.44
Junc201	16.4	1.88	29.61	1.25	39.00
Junc202	14.2	1.88	29.62	1.25	40.31
Junc203	16.5	3.75	29.38	2.50	38.78
Junc204	14.0	3.11	28.17	2.07	39.62
Junc205	16.0	1.14	27.90	0.76	38.33
Junc206	14.0	1.08	28.18	0.72	39.62
Junc207	17.1	1.65	24.62	1.10	37.56
Junc208	14.0	0.00	14.55	0.00	27.32

តារាងមានគណនា និងលទ្ធផល (Pipes) -1

LinkID	Node1 (Junction)	Node2 (Junction)	Diameter mm	Length m	Rough ness	Peak Demand		Extinction Demand	
						Flow LPS	Velocity m/s	Flow LPS	Velocity m/s
Pipe1	1	2	450	131	110	116.44	0.73	85.96	0.54
Pipe2	2	3	150	1,783	110	10.65	0.60	7.10	0.40
Pipe3	3	4	150	1,520	110	9.44	0.53	6.29	0.36
Pipe4	4	5	150	2,263	110	6.53	0.37	4.35	0.25
Pipe5	25	2	450	200	110	-105.79	0.67	-78.86	0.50
Pipe6	25	13	100	582	110	4.25	0.54	2.88	0.37
Pipe7	13	14	75	1,602	110	1.88	0.42	1.25	0.28
Pipe8	13	15	75	1,928	110	0.88	0.20	0.63	0.14
Pipe9	15	16	75	328	110	-0.57	0.13	-0.34	0.08
Pipe10	16	17	75	870	110	-1.38	0.31	-0.88	0.20
Pipe11	17	20	450	489	110	-100.98	0.63	-75.61	0.48
Pipe12	20	25	450	1,769	110	-101.54	0.64	-75.98	0.48
Pipe13	15	20	50	859	110	-0.56	0.28	-0.37	0.19
Pipe14	17	18	450	139	110	99.60	0.63	74.73	0.47
Pipe15	18	19	450	575	110	99.32	0.62	74.53	0.47
Pipe16	19	26	450	688	110	98.23	0.62	73.81	0.46
Pipe17	26	27	450	327	110	97.38	0.61	73.25	0.46
Pipe18	26	23	50	442	110	0.85	0.43	0.56	0.29
Pipe19	23	24	50	386	110	0.00	0.00	0.00	0.00
Pipe20	23	22	50	484	110	0.10	0.05	0.06	0.03
Pipe21	19	22	50	231	110	1.37	0.70	0.92	0.47
Pipe22	22	21	50	815	110	0.75	0.38	0.50	0.25
Pipe23	18	19	50	702	110	0.28	0.14	0.21	0.11
Pipe24	27	28	450	1,217	110	97.38	0.61	73.25	0.46
Pipe25	28	29	150	189	110	10.92	0.62	8.11	0.46
Pipe26	28	94	50	1,081	110	1.20	0.61	0.80	0.41
Pipe27	29	30	100	1,257	110	3.15	0.40	2.40	0.31
Pipe28	30	31	100	899	110	2.64	0.34	2.06	0.26
Pipe29	32	33	350	1,073	110	-72.43	0.75	-56.32	0.59
Pipe30	29	99	150	1,445	110	5.72	0.32	4.35	0.25
Pipe31	99	98	150	464	110	15.80	0.89	10.53	0.60
Pipe32	98	95	150	1,695	110	13.50	0.76	9.00	0.51
Pipe33	98	96	75	942	110	1.20	0.27	0.80	0.18
Pipe34	98	97	63	946	110	0.00	0.00	0.00	0.00
Pipe35	121	36	100	1,773	110	3.39	0.43	2.26	0.29
Pipe36	36	140	100	1,000	110	1.89	0.24	1.26	0.16
Pipe40	35	34	150	516	110	-2.37	0.13	-1.58	0.09
Pipe41	34	32	350	140	110	-72.82	0.76	-56.88	0.59
Pipe42	31	32	100	471	110	0.39	0.05	0.56	0.07
Pipe43	34	41	350	571	110	70.46	0.73	55.30	0.57
Pipe44	41	42	350	1,302	110	70.46	0.73	55.30	0.57
Pipe45	42	43	75	158	110	2.46	0.56	1.64	0.37
Pipe46	44	43	50	905	110	-0.48	0.24	-0.32	0.16
Pipe47	43	45	50	719	110	0.48	0.24	0.32	0.16
Pipe48	42	47	350	1,739	110	67.99	0.71	53.66	0.56
Pipe49	46	47	75	1,276	110	-1.51	0.34	-1.01	0.23
Pipe50	47	48	75	1,489	110	2.19	0.50	1.46	0.33
Pipe51	48	49	50	307	110	0.00	0.00	0.00	0.00
Pipe52	50	48	50	1,679	110	-0.69	0.35	-0.46	0.23
Pipe53	47	51	300	856	110	61.29	0.87	49.19	0.70
Pipe54	51	76	250	1,488	110	31.20	0.64	25.29	0.52

ព័ត៌មានគណនា និងលទ្ធផល (Pipes) -2

LinkID	Node1 (Junction)	Node2 (Junction)	Diameter mm	Length m	Rough ness	Peak Demand		Extinction Demand	
						Flow LPS	Velocity m/s	Flow LPS	Velocity m/s
Pipe55	76	78	250	728	110	25.45	0.52	20.59	0.42
Pipe56	78	79	250	284	110	23.12	0.47	19.04	0.39
Pipe57	79	80	250	159	110	22.04	0.45	18.32	0.37
Pipe58	80	81	250	535	110	18.94	0.39	16.25	0.33
Pipe59	81	82	250	585	110	18.94	0.39	16.25	0.33
Pipe60	82	83	200	880	110	17.00	0.54	14.96	0.48
Pipe61	83	84	200	548	110	17.00	0.54	14.96	0.48
Pipe62	84	85	200	712	110	17.00	0.54	14.96	0.48
Pipe63	85	86	200	657	110	15.44	0.49	13.92	0.44
Pipe64	86	87	75	890	110	0.00	0.00	0.00	0.00
Pipe65	86	88	200	1,290	110	13.72	0.44	12.77	0.41
Pipe66	88	89	150	991	110	3.88	0.22	2.59	0.15
Pipe67	89	90	150	791	110	2.63	0.15	1.75	0.10
Pipe68	90	91	100	2,169	110	2.63	0.33	1.75	0.22
Pipe69	91	93	75	875	110	1.34	0.30	0.89	0.20
Pipe70	93	92	75	1,301	110	0.74	0.17	0.49	0.11
Pipe71	64	65	100	776	110	-1.50	0.19	-1.00	0.13
Pipe72	65	66	150	662	110	-3.16	0.18	-10.44	0.59
Pipe73	66	67	150	773	110	-3.16	0.18	-10.44	0.59
Pipe74	67	68	150	1,163	110	-6.38	0.36	-12.58	0.71
Pipe75	68	69	200	651	110	-10.88	0.35	-15.58	0.50
Pipe76	69	70	200	510	110	-14.04	0.45	-17.69	0.56
Pipe77	70	71	200	346	110	-14.04	0.45	-17.69	0.56
Pipe78	100	71	100	650	110	1.71	0.22	2.15	0.27
Pipe79	100	102	200	615	110	5.38	0.17	7.28	0.23
Pipe81	100	101	50	884	110	0.00	0.00	0.00	0.00
Pipe82	100	72	200	489	110	-8.17	0.26	-10.15	0.32
Pipe83	72	75	100	815	110	0.88	0.11	-0.27	0.03
Pipe84	72	73	200	873	110	-13.62	0.43	-12.93	0.41
Pipe85	73	57	200	1,099	110	-14.23	0.45	-13.34	0.42
Pipe86	74	75	100	872	110	-0.88	0.11	0.27	0.03
Pipe87	77	74	100	564	110	3.61	0.46	3.26	0.42
Pipe88	76	77	100	983	110	5.75	0.73	4.69	0.60
Pipe89	57	58	150	260	110	5.97	0.34	3.98	0.23
Pipe90	58	59	150	1,361	110	5.97	0.34	3.98	0.23
Pipe91	59	63	150	2,121	110	5.05	0.29	3.37	0.19
Pipe92	63	62	150	955	110	2.80	0.16	1.87	0.11
Pipe93	62	61	100	1,266	110	2.09	0.27	1.39	0.18
Pipe94	61	60	75	937	110	1.19	0.27	0.79	0.18
Pipe95	51	52	250	857	110	30.09	0.61	23.91	0.49
Pipe96	52	53	250	978	110	28.84	0.59	23.08	0.47
Pipe97	53	54	250	524	110	28.84	0.59	23.08	0.47
Pipe98	54	55	250	400	110	25.39	0.52	20.78	0.42
Pipe99	55	56	200	609	110	24.25	0.77	20.02	0.64
Pipe100	56	57	200	668	110	22.65	0.72	18.95	0.60
Pipe101	5	6	150	1,701	110	6.53	0.37	4.35	0.25
Pipe102	6	7	150	127	110	6.53	0.37	4.35	0.25
Pipe103	7	8	150	1,764	110	6.53	0.37	4.35	0.25
Pipe104	8	9	50	552	110	0.00	0.00	0.00	0.00
Pipe105	8	10	150	1,538	110	6.53	0.37	4.35	0.25
Pipe106	10	11	100	1,495	110	4.23	0.54	2.82	0.36



ព័ត៌មានគណនា និងលទ្ធផល (Pipes) -3

LinkID	Node1 (Junction)	Node2 (Junction)	Diameter mm	Length m	Rough ness	Peak Demand		Extinction Demand	
						Flow LPS	Velocity m/s	Flow LPS	Velocity m/s
Pipe107	11	12	75	1,987	110	1.61	0.36	1.07	0.24
Pipe108	28	99	400	1,655	110	85.26	0.68	64.34	0.51
Pipe109	104	108	250	681	110	46.06	0.94	33.95	0.69
Pipe110	108	109	250	144	110	116.71	2.38	86.04	1.75
Pipe111	108	104	300	749	110	-70.65	1.00	-52.08	0.74
Pipe112	110	109	250	128	110	-116.71	2.38	-86.04	1.75
Pipe113	110	111	250	380	110	36.57	0.74	24.63	0.50
Pipe114	110	113	100	247	110	8.03	1.02	5.44	0.69
Pipe115	113	115	100	288	110	7.98	1.02	5.24	0.67
Pipe116	115	114	50	593	110	-0.66	0.33	-0.44	0.22
Pipe117	114	112	100	439	110	-5.96	0.76	-3.95	0.50
Pipe118	111	112	250	201	110	36.57	0.74	24.63	0.50
Pipe119	115	116	75	731	110	3.29	0.75	2.12	0.48
Pipe120	116	107	75	530	110	0.29	0.07	0.12	0.03
Pipe121	107	117	50	530	110	-1.45	0.74	-0.94	0.48
Pipe122	117	118	100	58	110	-1.45	0.19	-0.94	0.12
Pipe123	118	114	100	610	110	-2.74	0.35	-1.80	0.23
Pipe124	104	105	100	956	110	9.52	1.21	6.45	0.82
Pipe125	105	106	100	285	110	7.87	1.00	5.35	0.68
Pipe126	106	107	50	240	110	1.06	0.54	0.81	0.41
Pipe127	119	106	100	799	110	-5.12	0.65	-3.41	0.43
Pipe128	120	119	100	1,062	110	-3.92	0.50	-2.61	0.33
Pipe129	112	122	150	973	110	18.94	1.07	12.63	0.71
Pipe130	122	121	150	944	110	16.32	0.92	10.88	0.62
Pipe132	121	123	150	1,111	110	9.78	0.55	6.52	0.37
Pipe133	123	129	100	313	110	2.38	0.30	1.59	0.20
Pipe134	123	130	150	1,111	110	7.01	0.40	4.67	0.26
Pipe135	130	131	150	302	110	5.70	0.32	3.80	0.22
Pipe136	131	132	150	2,922	110	1.82	0.10	1.21	0.07
Pipe137	132	133	50	340	110	0.41	0.21	0.27	0.14
Pipe138	131	139	150	2,517	110	1.50	0.08	1.00	0.06
Pipe139	130	128	75	308	110	1.31	0.30	0.87	0.20
Pipe140	128	126	75	457	110	0.59	0.13	0.39	0.09
Pipe142	124	125	50	242	110	-0.51	0.26	-0.34	0.17
Pipe143	125	129	100	518	110	-2.35	0.30	-1.57	0.20
Pipe144	129	123	50	313	110	-0.39	0.20	-0.26	0.13
Pipe145	129	128	50	1,073	110	0.42	0.21	0.28	0.14
Pipe146	125	126	50	1,076	110	0.34	0.17	0.23	0.12
Pipe148	134	132	100	522	110	-1.11	0.14	-0.74	0.09
Pipe149	134	137	100	1,064	110	1.11	0.14	0.74	0.09
Pipe151	138	137	100	1,368	110	-0.75	0.10	-0.50	0.06
Pipe152	112	146	100	295	110	6.79	0.86	4.73	0.60
Pipe153	146	145	100	101	110	6.39	0.81	4.46	0.57
Pipe154	145	144	100	130	110	4.34	0.55	3.05	0.39
Pipe155	99	33	350	678	110	73.18	0.76	56.82	0.59
Pipe156	149	150	100	101	110	0.00	0.00	0.00	0.00
Pipe157	148	149	100	253	110	1.41	0.18	0.81	0.10
Pipe160	142	143	100	125	110	-3.24	0.41	-2.45	0.31
Pipe161	143	147	100	124	110	-4.20	0.53	-3.04	0.39
Pipe162	147	113	100	269	110	-4.93	0.63	-3.52	0.45
Pipe163	142	144	50	264	110	0.30	0.16	0.18	0.09

ព័ត៌មានគណនា និងលទ្ធផល (Pipes) -4

LinkID	Node1 (Junction)	Node2 (Junction)	Diameter mm	Length m	Rough ness	Peak Demand		Extinction Demand	
						Flow LPS	Velocity m/s	Flow LPS	Velocity m/s
Pipe164	143	145	50	263	110	-0.04	0.02	-0.07	0.03
Pipe165	147	146	50	264	110	-0.40	0.20	-0.27	0.14
Pipe166	113	112	100	343	110	-4.87	0.62	-3.32	0.42
Pipe167	154	153	150	245	110	-6.05	0.34	-4.00	0.23
Pipe168	153	152	150	235	110	-7.41	0.42	-5.17	0.29
Pipe169	164	165	100	388	110	-1.93	0.25	-1.51	0.19
Pipe170	161	163	150	118	110	0.58	0.03	0.90	0.05
Pipe171	163	165	150	142	110	-1.08	0.06	-1.36	0.08
Pipe172	165	157	150	805	110	-4.66	0.26	-3.72	0.21
Pipe173	160	166	100	230	110	-2.54	0.32	-2.06	0.26
Pipe175	166	156	150	465	110	-9.90	0.56	-7.49	0.42
Pipe176	156	155	150	263	110	-17.46	0.99	-12.95	0.73
Pipe177	155	110	250	299	110	-19.44	0.40	-14.39	0.29
Pipe178	156	158	100	108	110	7.56	0.96	5.45	0.69
Pipe179	158	157	100	129	110	1.53	0.19	1.34	0.17
Pipe180	157	168	150	256	110	-7.64	0.43	-5.38	0.30
Pipe181	168	169	150	239	110	-12.73	0.72	-8.76	0.50
Pipe182	169	159	150	146	110	-12.73	0.72	-8.76	0.50
Pipe184	155	167	50	116	110	1.99	1.01	1.45	0.74
Pipe185	167	168	50	136	110	-0.59	0.30	-0.38	0.19
Pipe186	158	167	100	248	110	1.01	0.13	0.52	0.07
Pipe187	161	171	150	174	110	-5.99	0.34	-4.51	0.26
Pipe188	171	166	150	288	110	-7.36	0.42	-5.43	0.31
Pipe189	162	174	150	177	110	-1.51	0.09	-2.13	0.12
Pipe190	174	163	150	340	110	-1.66	0.09	-2.26	0.13
Pipe191	174	173	100	470	110	0.15	0.02	0.13	0.02
Pipe192	164	172	100	323	110	-1.07	0.14	-0.49	0.06
Pipe193	172	175	100	444	110	-2.97	0.38	-1.59	0.20
Pipe194	172	173	100	167	110	-2.33	0.30	-1.78	0.23
Pipe195	173	160	100	265	110	-2.17	0.28	-1.65	0.21
Pipe196	176	162	150	498	110	-1.51	0.09	-2.13	0.12
Pipe197	176	172	50	241	110	0.27	0.14	0.11	0.06
Pipe198	177	175	100	265	110	-3.39	0.43	-1.97	0.25
Pipe199	176	177	150	411	110	-1.90	0.11	-0.08	0.00
Pipe201	160	154	50	853	110	-0.20	0.10	0.03	0.02
Pipe202	175	178	200	265	110	-6.45	0.21	-3.49	0.11
Pipe203	178	151	200	292	110	-11.25	0.36	-6.35	0.20
Pipe204	178	153	100	312	110	-1.36	0.17	-1.17	0.15
Pipe205	175	154	50	338	110	0.09	0.05	-0.07	0.04
Pipe206	151	152	250	296	110	-21.46	0.44	-18.98	0.39
Pipe207	167	179	50	381	110	-0.92	0.47	-0.65	0.33
Pipe208	110	179	250	214	110	49.74	1.01	39.62	0.81
Pipe209	179	159	250	134	110	48.82	0.99	38.97	0.79
Pipe210	160	182	100	866	110	-2.77	0.35	-1.86	0.24
Pipe211	182	180	150	270	110	-3.13	0.18	-2.25	0.13
Pipe212	159	180	250	316	110	33.41	0.68	27.99	0.57
Pipe213	180	152	250	383	110	30.28	0.62	25.74	0.52
Pipe214	182	183	100	244	110	0.36	0.05	0.40	0.05
Pipe215	152	183	100	268	110	-3.04	0.39	-2.62	0.33
Pipe216	183	159	100	446	110	-2.68	0.34	-2.23	0.28
Pipe217	177	187	150	458	110	1.49	0.08	1.90	0.11

ព័ត៌មានគណនា និងលទ្ធផល (Pipes) -5

LinkID	Node1 (Junction)	Node2 (Junction)	Diameter mm	Length m	Rough ness	Peak Demand		Extinction Demand	
						Flow LPS	Velocity m/s	Flow LPS	Velocity m/s
Pipe219	184	151	250	216	110	-10.21	0.21	-12.63	0.26
Pipe220	184	152	150	537	110	4.45	0.25	4.21	0.24
Pipe221	185	186	150	133	110	-10.98	0.62	-6.88	0.39
Pipe222	186	184	150	161	110	-14.65	0.83	-8.51	0.48
Pipe223	187	188	150	149	110	-2.96	0.17	-1.08	0.06
Pipe224	188	186	150	185	110	-3.67	0.21	-1.63	0.09
Pipe225	188	178	100	584	110	-2.33	0.30	-1.48	0.19
Pipe226	185	141	100	143	110	7.58	0.96	4.61	0.59
Pipe227	185	192	100	405	110	3.41	0.43	2.27	0.29
Pipe228	192	190	100	414	110	4.61	0.59	3.07	0.39
Pipe229	190	189	100	440	110	-1.23	0.16	-0.82	0.10
Pipe230	189	187	100	718	110	-4.45	0.57	-2.97	0.38
Pipe231	188	191	100	570	110	1.20	0.15	0.80	0.10
Pipe232	191	192	50	107	110	1.20	0.61	0.80	0.41
Pipe233	190	196	100	420	110	5.84	0.74	3.89	0.50
Pipe234	196	197	100	530	110	4.08	0.52	2.72	0.35
Pipe235	197	193	100	678	110	2.40	0.31	1.60	0.20
Pipe236	80	195	100	307	110	2.23	0.28	1.49	0.19
Pipe237	195	194	100	511	110	1.08	0.14	0.72	0.09
Pipe238	199	198	100	274	110	-0.91	0.12	-0.61	0.08
Pipe239	148	198	100	533	110	1.59	0.20	1.06	0.13
Pipe240	200	161	100	113	110	0.00	0.00	0.00	0.00
Pipe242	144	202	100	562	110	4.65	0.59	3.23	0.41
Pipe243	201	142	100	615	110	-2.94	0.37	-2.27	0.29
Pipe245	202	204	100	684	110	2.77	0.35	1.98	0.25
Pipe247	141	203	100	362	110	2.69	0.34	1.48	0.19
Pipe248	203	201	100	326	110	-1.06	0.14	-1.02	0.13
Pipe249	204	206	100	303	110	-0.33	0.04	-0.09	0.01
Pipe250	141	205	100	405	110	4.89	0.62	3.13	0.40
Pipe251	205	148	100	324	110	3.75	0.48	2.37	0.30
Pipe252	149	206	100	251	110	1.41	0.18	0.81	0.10
Pipe253	207	105	100	1,762	110	-1.65	0.21	-1.10	0.14
Pipe254	71	208	200	235	110	-13.92	0.44	-16.60	0.53
Pipe255	102	208	200	289	110	5.38	0.17	7.28	0.23
Pipe256	208	88	200	143	110	-8.54	0.27	-9.32	0.30
Pipe257	165	170	100	72	110	-2.90	0.37	-2.19	0.28
Pipe258	170	171	100	72	110	-1.37	0.17	-0.93	0.12
Pipe259	170	158	100	775	110	-1.53	0.19	-1.26	0.16
Pipe264	181	104	300	73	110	126.22	1.79	92.48	1.31

**ឧបសម្ព័ន្ធ 7.10**

**ការប៉ាន់ស្មានចំនួនគ្រួសារក្រីក្រ**  
**Assumption of the number of poor households**

# 1. Assumption of the number of poor households

## ចំនួនគ្រួសារក្រីក្រក្នុងតំបន់សេវាក្នុងគម្រោង

ចំនួនគ្រួសារក្រីក្រប្រភេទ 1 ក្នុងតំបន់សេវា នាឆ្នាំ 2025 តាមការប៉ាន់ស្មាន នឹងមានចំនួន 1,248 ខ្ទង់ផ្ទះ តាមរូបមន្តខាងក្រោម និងផ្អែកលើទិន្នន័យ "Identification of Poor Household Program" រៀបចំដោយ ក្រសួងផែនការ នៃប្រទេសកម្ពុជា នាឆ្នាំ 2010 និង 2011។

Number of poor households (F) =  $\Sigma$  {Rate of poor households by village (C) x Number of households by village in 2025 (E)}

Where,

Number of households by village (E): Design population served in 2025

÷ Number of household members: 4.91 \*

\* Number of household members: Design population served 75,033

÷ Number of services 15,282 (in 2025)

## ចំនួនគ្រួសារក្រីក្រគោលដៅក្នុងគម្រោង

ចំនួនគ្រួសារក្រីក្រ ដែលនឹងទទួលបានសំភារៈតំណចូលផ្ទះក្រោមគម្រោងនេះ មានចំនួន 257 ខ្ទង់ផ្ទះ (ជា តួលេងបានដោយយកចំនួន 1,248 ដែលគណនាខាងលើ ដកនឹង 991 ដែលជាចំនួនគ្រួសារក្រីក្រទទួល បានការគាំទ្ររួចហើយ។)

**តារាង 6 ចំនួនគ្រួសារក្រីក្រ ក្នុងតំបន់សេវាក្នុងគម្រោង**

Commune	VillageName	(B*) Poor 1 Households	(C)=(B*)/(A) Rate of Total Poor	(D) 2025 year population	(E)=(D)/4.91 2025 year population	Poor Households	Poor Households (Urban)	Poor Households (Rural)
07 Snam Preah	Svay Att	18	16.2%	549	112	19		19
07 Snam Preah	Kam Peanh Svay	14	10.3%	742	152	16		16
07 Snam Preah	Dang Keab Kdam	23	17.3%	523	107	19		19
8 Snam Preah	Ang Doung Sambour	16	10.2%	40	9	1		1
9 Snam Preah	Snam Preah	8	4.2%	58	12	1		1
01 Anlong Vil	Toul Cha	230	19.1%	492	101	20		20
01 Anlong Vil	Ou Bakon	12	18.2%	417	85	16		16
01 Anlong Vil	Wat Por 1	13	15.7%	643	131	21		21
01 Anlong Vil	Wat Por 2	4	7.8%	327	67	6		6
01 Anlong Vil	Kancheut Baydak	10	16.1%	451	92	15		15
01 Anlong Vil	Ang long Vil	4	7.0%	262	54	4		4
01 Anlong Vil	Preak Ta Voung	21	23.3%	560	114	27		27
01 Anlong Vil	Kampong Kra bey	7	12.5%	263	54	7		7
01 Anlong Vil	Phlouy Kra bey	5	8.8%	298	61	6		6
01 Anlong Vil	Preak Ta Kong	11	18.3%	0	0			
01 Anlong Vil	Koah Kra sang	14	20.6%	0	0			
01 Anlong Vil	Preak Chheur Trav	25	26.9%	0	0			
01 Anlong Vil	Chey Chommas	28	29.2%	0	0			
01 Anlong Vil	Boeung Chhouk	22	20.8%	0	0			
01 Anlong Vil	Kbal Ro meas	11	12.1%	0	0			
03 Kandieng	Kandieng Knoung	8	12.1%	321	66			
03 Kandieng	Kandieng	12	16.7%	352	72			
03 Kandieng	Station	17	15.0%	270	55			
03 Kandieng	Yous	7	10.3%	63	13			
03 Kandieng	Keo Vi chey	13	15.1%	6	2			
03 Kandieng	Prey Kdey leu	9	20.9%	45	10			
03 Kandieng	Prey Kdey Kandal	9	16.7%	38	8			
03 Kandieng	Kampong Roka	8	15.1%	0	0			
03 Kandieng	Svay Yeang	15	19.5%	0	0			
03 Kandieng	Bong Kol	16	12.7%	0	0			
03 Kandieng	Steoung Leu	14	15.4%	0	0			
03 Kandieng	Steoung Krom	14	16.9%	0	0			
03 Kandieng	Kampong Krasang leu	3	3.9%	0	0			
03 Kandieng	Kampong Krasang Kron	11	11.2%	0	0			
03 Kandieng	Boeung Chhouk	18	11.1%	0	0			
03 Kandieng	Prey Kdey Krom	12	12.5%	0	0	0		0
07 Svay Luong	Boeung Kranh	13	10.7%	328	67			
07 Svay Luong	Rong Machine	2	2.6%	157	32			

ឧបសម្ព័ន្ធ 7.10 ការប៉ាន់ស្មានចំនួនខ្ទង់ដ្ឋៈក្រីក្រ

Commune	VillageName	(B) Poor 1 Households	(C)=(B)/(A) Rate of Total Poor	(D) 2025 year population	(E)=(D)/4.91 2025 year population	Poor Households	Poor Households (Urban)	Poor Households (Rural)
07 Svay Luong	Svay Luong	3	5.0%	232	48			
07 Svay Luong	Svay Chan	4	3.8%	130	27			
07 Svay Luong	Plouv portivong	22	30.1%	160	33			
07 Svay Luong	Svay Chambok	23	28.8%	391	80	23		23
07 Svay Luong	Por Leung	4	4.6%	0	0			
07 Svay Luong	Ko Kor	3	5.5%	0	0			
07 Svay Luong	San lot	5	7.8%	0	0			
07 Svay Luong	Svay Yeang	16	15.1%	0	0			
09 Veal	Kbal Hong	14	9.8%	869	178	18		18
09 Veal	Bralay Thom	68	35.2%	998	204	72		72
09 Veal	Veal	8	6.7%	513	105	8		8
09 Veal	Por Kambor	23	15.4%	669	137	22		22
09 Veal	Kancheut Baydak	4	4.4%	385	79	4		4
09 Veal	Por Damnak	9	5.6%	692	141	8		8
09 Veal	Boeung Ya	13	11.4%	508	104	12		12
09 Veal	Ta Sdey	26	28.3%	440	90	26		26
09 Veal	Toul Pon Ro	9	11.1%	462	95	11		11
10 Kaoh Chum	Bridge	17	8.9%	1073	219	20		20
10 Kaoh Chum	Dong Ron	24	14.6%	1062	217	32		32
10 Kaoh Chum	Ang long hab	11	6.4%	862	176	12		12
01 Chanraeun Phal	Leav	56	32.0%	672	137	44		44
01 Chamraeun Phal	Au Toung	32	17.3%	1423	290	51		51
01 Chamraeun Phal	Svay Meas	10	8.3%	658	135	12		12
03 Lolok Sa	Por ta koy	8	3.1%	1422	290	9		9
03 Lolok Sa	Preak Sdey	9	3.4%	1478	302	11		11
03 Lolok Sa	Lolork sa	3	2.8%	536	110	4		4
03 Lolok Sa	Phsar Leu	2	2.0%	631	129	3		3
03 Lolok Sa	Phum Kok	33	15.3%	1223	250	39		39
03 Lolok Sa	Wat Loung	13	6.2%	1364	278	18		18
03 Lolok Sa	Chhom rom siem	13	10.4%	1020	208	22		22
04 Phteah Prey	Peal nheak 1	44	2.5%	3298	672	18		18
04 Phteah Prey	Peal nheak 2	44	2.5%	3404	694	18		18
04 Phteah Prey	Khal Hong	44	2.5%	1355	276	8		8
04 Phteah Prey	North banana plantation	4	0.9%	3266	666	6		6
04 Phteah Prey	South banana plantation	4	1.5%	1025	209	4		4
04 Phteah Prey	Ou Sdav	1	0.7%	785	160	2		2
04 Phteah Prey	Ra	4	1.3%	1608	328	5		5
04 Phteah Prey	Thnort Threat	8	4.4%	1100	225	10		10
04 Phteah Prey	Kork	19	10.9%	887	181	20		20
04 Phteah Prey	Dong ka	4	2.0%	1158	236	5		5
05 Prey Nhi	Bak roteas	25	10.4%	1652	337	36		36
05 Prey Nhi	Doung Chhroum	3	2.4%	639	131	4		4
05 Prey Nhi	Bralay Thom	4	3.9%	449	92	4		4
05 Prey Nhi	Kbal saen thmor	1	1.1%	437	89	1		1
05 Prey Nhi	Man chear	27	13.9%	1450	296	42		42
05 Prey Nhi	Krang Ta Sen	24	15.1%	423	87	13		13
05 Prey Nhi	Sala Komrou	14	13.5%	790	161	22		22
05 Prey Nhi	Sras Srong	8	10.3%	300	62	7		7
06 Roleab	Por Andat	4	3.3%	730	149	5		5
06 Roleab	Thnorl Bombeak	7	6.5%	725	148	10		10
06 Roleab	Concrete bridge	182	6.3%	1267	259	17		17
06 Roleab	Chhloun kat	7	4.7%	712	146	7		7
06 Roleab	Steung Toch	7	5.0%	763	156	8		8
06 Roleab	Japan road	9	4.4%	1093	223	10		10
06 Roleab	Preak Ori mal	26	5.3%	2711	553	30		30
06 Roleab	Soriya leu	1	1.4%	486	99	2		2
06 Roleab	Soriya krom	6	7.2%	365	75	6		6
06 Roleab	Preak Tnout	2	1.1%	996	203	3		3
06 Roleab	Toul Makak	15	4.7%	1474	301	15		15
06 Roleab	Roleab	56	9.3%	4	1	1		1

ឧបសម្ព័ន្ធ 7.10 ការប៉ាន់ស្មានជំនួននិរន្តរ៍ក្រីក្រ

Commune	VillageName	(B) Poor 1 Households	(C)=(B <sup>n</sup> )/(A) Rate of Total Poor	(D) 2025 year population	(E)=(D)/4.91 2025 year population	Poor Households	Poor Households (Urban)	Poor Households (Rural)
07 Svay At	Kran Pomlak	5	2.6%	1143	233	6	6	
07 Svay At	Trang	6	6.3%	514	105	7	7	
07 Svay At	Station	28	8.8%	1742	355	32	32	
07 Svay At	Ou Sdav	20	11.0%	1151	235	26	26	
07 Svay At	Svat At	43	20.7%	1477	301	63	63	
08 Bateay Dei	Ou Bakon leu	7	11.1%	398	82	10	10	
08 Bateay Dei	Ou Bakon Krom	12	10.1%	479	98	10	10	
08 Bateay Dei	Ou Bakon Kandal	8	13.8%	256	53	8	8	
08 Bateay Dei	Keo Sovann leu	4	3.7%	680	139	6	6	
08 Bateay Dei	Keo Sovann krom	4	5.6%	339	70	4	4	
08 Bateay Dei	Kbal Hong	10	11.4%	695	142	17	17	
08 Bateay Dei	Bondous Sandaek	15	11.9%	548	112	14	14	
08 Bateay Dei	Ouek Slam	9	5.4%	764	156	9	9	
08 Bateay Dei	Banteay dey leu	5	3.2%	724	148	5	5	
08 Bateay Dei	Banteay dey krom	6	5.0%	592	121	7	7	
08 Bateay Dei	Keo Mony	13	10.7%	652	133	15	15	
08 Bateay Dei	Ta Koy	9	11.1%	453	93	11	11	
Total		1990	10.6% (Average)	75035	15329	1248	983	265



**ឧបសម្ព័ន្ធ 7.11**

**ព័ត៌មានគ្រឹះអំពីវិស័យទឹកស្អាត នៅក្នុងប្រទេស/អង្គការនានា**  
**Basic information of the water sector in each country/organization**

Basic information of the water sector in each country/organization

Country: Cambodia Organization: Pursat Water Works

	指標・情報/ Indicators & Information	Figure/Information	Unit	Resource/ Calculation basis
<b>セクター概要 (Sector Information)</b>				
1	国家人口 / Total Population of the country	1,630	people	2018, IMF
	一人当たりGDP/ GDP per capita	1,485	USD/capita	2018, IMF
2	年間降水量/ Annual rainfall	1,410	mm/year	MOWRAM, 1996-2016
	気候帯/ Climatic zone	Tropical Monsoon		Statistic Yearbook 2008 Ministry of Planning
3	改善された水源へのアクセス率/ % of access to improved water sources	75	%	JMP2017
4	水道セクターのガバナンス/ Governance of the water sector	The water supply department in General Affairs of the Industry in Ministry of Industry and Handycraft has jurisdiction over the water supply to urban areas. Waterworks, which is a subordinate organization of the DIH in each state, operates and maintains actual water supply. There are 24 provinces in Cambodia. Water Supply Corporation in Phnom Penh and Siem Reap city, Public water surveces (Water Works) in the capital city of 12 provinces), and other private enterprises in other provinces have responsibility to supply water. Water supply to rural areas is under the jurisdiction of Rural water supply department in the Ministry of Rural Development.		Survey on the Water Supply Sector in the Kingdom of Cambodia, June, 2010, JICA
5	主要な開発方針、開発課題/ Main development strategies and challenges (National strategies, master plan, relevant regulations, structural reform plans, etc.)	Cambodian government set up "Citizens receive safe water supply, have sanitation facilities, enjoy safe, hygienic and environmentally adapted living environment " as national policy in water supply sector. Goal in 2025: 100% of citizens can access safety water in urban area. There is not any relevant laws on water supply. Cambodian Government proceeds to formulate the laws currently. MIH publishes water quality standards on drinking water.		National Policy on Water Supply and Sanitation, 2003 National Strategic Development Plan (NSDP, 2014-2018)
<b>Outline of the Organization</b>				
1	水道事業者の形態、監督・規制体制/ (1) Type of the organization (State enterprise / Independent water utility, etc.) (2) Ministry or other government agency which is overseeing the organization	Pursat Water Works under Pursat DIH supplies water to the urban area in Pursat province.		Project on Capacity Building for Urban Water Supply System in Cambodia (Phase 3), Monitoring Report, May 2014, JICA
2	当該水道事業者の計画給水区域/ Geographical area for which the organization is responsible for to provide water supply services	3Districts(Bakan, Kandiang, Krong Pursat), 13Communes, 97Villages		
3	水源/ Type of water sources	Surface Water : Pursat River		
4	水源開発余力/ Potential for future development of water sources	Minimum Discharge from Dhamnak Ampil to the downstream: 6.67m <sup>3</sup> /sec Intake Amount: 0.09m <sup>3</sup> /sec Necessary Environmental Discharge to the Downstream: 4.48m <sup>3</sup> /sec		
5	水道普及率/ Service coverage ratio	37.8 (2018, Water Supplied Population(urban area 35,682+rural area 4,003) /Population in Administrative Area 99,691)	%	
6	給水人口/ Service population	37,661 (2018)	people	

ឧបសម្ព័ន្ធ 7.11 ព័ត៌មានគ្រឹះអំពីវិស័យទឹកស្អាត នៅក្នុងប្រទេស/អង្គភាពនានា

7	一日平均給水量/ Average daily water supply volume	5,607 (2018)	m <sup>3</sup> /day	
8	一人一日平均給水量/ Average daily per-capita water supply volume	100 (Average in 2013 - 2018)	litre/person/day	
9	給水時間/ Average service hours	24 (2016)	hour/day (or hour/week)	
10	無収水率/ Non-revenue water ratio		11.3 %	
11	財務規模、収支/ Fiscal scale, Operating cost coverage	<2018> Gross Income: 3,189 million Riel (88.69million Yen) Total Cost: 2,783million Riel (77.39million Yen) (Depreciation Cost Inclusive) Net Income: 406million Riel (11.30million Yen)		
12	水道料金水準/ (1) Water tariff structure (2) Average tariff (USD/m <sup>3</sup> )	1,600 Riel/m <sup>3</sup> (0.40USD/m <sup>3</sup> )	USD/m <sup>3</sup>	
13	料金徴収率/ Tariff collection ratio	100 (2017)	%	
14	メーター設置率/ Customer meter installation ratio	100 (2017)	%	
15	1,000接続当たりの職員数/ Number of employees per 1,000 connections	5.2 (2017)	staff/1,000 connections	
16	施設の状況、施設の運転・維持管理状況/ Current issues of water supply facilities and their O&M (e.g., leakage, water quality degradation due to old equipment or over-capacity operation etc., low/high water pressure, etc.)	Regarding water supply facilities, ADB conducted a renovation project in 2007. In addition, as a result of extending the capacity by the Pursat Waterworks, the water supply capacity as of 2017 was 7,260 m <sup>3</sup> / day. Failed valves are reported at intake pump stations in existing water supply facilities, but other major facilities are in operation. In the expenditure plan, a certain amount of repair and maintenance expenses are recorded monthly. Regarding the above-mentioned failed valves, the waterworks repaired it during the dry season from 2017 to 2018. Regarding the operation and maintenance of the facility, the Pursat Waterworks has basic technical capabilities through the technical cooperation project "Project on Capacity Building for Urban Water Supply System in Cambodia (Phase 3)".		
17	水道事業体の業務目標と課題/ (1) Business plan and strategy (Mid-term strategy, target performance indicators, etc.) (2) Challenges of the organization	There is no mid- to long-term plan concerning the Pursat water service business. The Waterworks formulates the annual business plan and is approved by Department of Industry and Handicraft of Pursat province (DIH) and is submitted to the Minister of Industry and Handicraft (MIH) from DIH, every year. In recent years, connection of 100 houses per year has been progressing. However, as the water supply facilities expand, additional maintenance staff will be required. The non-revenue water ratio is around 10%, which is low as a developing country.		

**ឧបសម្ព័ន្ធ 7.12**

**ទំហំគម្រោងជំនួយឥតសំណងរបស់ JICA ក្នុងក្រុងពោធិសាត់  
SCOPE OF JICA GRANT AID PROJECT IN PURSAT  
(STUDY OF WATER SUPPLY AREA)**

**1. គោលបំណង និងវិធីសាស្ត្រនៃដំណាក់កាលសិក្សា**

ដើម្បីកំណត់តំបន់ផ្គត់ផ្គង់ទឹកស្អាត ដែលជាកត្តាមូលដ្ឋាននៃលក្ខខណ្ឌគម្រោងជំនួយឥតសំណង JICA ក្នុងក្រុងពោធិសាត់ នោះគេសិក្សាដូចខាងក្រោម។

ដំបូង តំបន់នោះ ត្រូវបានបែងចែកជា 7 ករណី នៃតំបន់ចែកចាយទឹក ដោយគិតអំពីតំបន់ អាទិភាពដែលកំណត់ដោយភាគីកម្ពុជា និងតំបន់ដែលមានប្រសិទ្ធភាពផ្នែកវិនិយោគ។

បន្ទាប់មកទៀត ចំនួនប្រជាជនដែលត្រូវទទួលសេវាទឹកស្អាត និងបរិមាណទឹកចែកចាយប្រចាំថ្ងៃ អតិបរមា ដែលត្រូវពង្រីក ត្រូវបានគណនាដោយផ្អែកលើការព្យាករណ៍តម្រូវការទឹកឆ្នាំ 2025។

ជាបន្ត ការសិក្សាដំបូងនៃអាគារនិងបរិក្ខាផ្សេងៗ ដូចជា ស្ថានីយបូមទឹកនៅ បំពង់នាំទឹកនៅ រោងចក្រប្រព្រឹត្តកម្មទឹកស្អាត និងបរិក្ខាចែកចាយទឹកស្អាត ត្រូវបានធ្វើឡើង ឲ្យមានសមត្ថភាពទៅ តាមបរិមាណទឹកចែកចាយប្រចាំថ្ងៃអតិបរមាដៅចំពោះខាងលើ។

ជាចុងក្រោយ ថ្លៃដើម&ផ្លាស់ប្តូរថ្មី និងថ្លៃដំណើរការ&ការថែទាំ ត្រូវបានគណនា ហើយការវិភាគ cost-benefit analysis ក៏ត្រូវបានពិនិត្យដែរ។ តំបន់ផ្គត់ផ្គង់ទឹកស្អាតដែលល្អបំផុតមួយ នឹងត្រូវស្នើឡើង ដោយផ្អែកលើលទ្ធផលសិក្សានេះ។

**2. ករណីសិក្សា និងការសន្មតនានា**

(1) **តំបន់ផ្គត់ផ្គង់ទឹក:** តំបន់ លើកយកមកសិក្សាទៅតាមសំណើភាគីកម្ពុជា និងការ ពិចារណាលើប្រសិទ្ធភាពវិនិយោគ។

(2) **ចំនួនប្រជាជនទទួលសេវាទឹកស្អាត និងបរិមាណទឹកចែកចាយប្រចាំថ្ងៃអតិបរមា:** ចំនួន ប្រជាជនទទួលសេវាទឹកស្អាត បានត្រូវគណនាចំពោះតំបន់ដែលមានស្រាប់ បូកនឹងតំបន់ដែល ត្រូវពង្រីកក្នុងគម្រោង ព្យាករណ៍ដល់ឆ្នាំ 2025។ បរិមាណទឹកចែកចាយប្រចាំថ្ងៃអតិបរមា បានត្រូវ គណនាតាមចំនួនប្រជាជនទទួលសេវាទឹកស្អាតនោះ។

(3) **សង្ខេបអំពីផែនការប្រព័ន្ធផ្គត់ផ្គង់ទឹកស្អាត:** ស្ថានីយបូមទឹកនៅ បណ្តាញនាំទឹកនៅ រោងចក្រប្រព្រឹត្តកម្មទឹកស្អាត និងបណ្តាញចែកចាយទឹកស្អាត ដែលសមត្ថភាពរបស់ប្រព័ន្ធនីមួយ ៗ ស្របទៅនឹងបរិមាណផ្គត់ផ្គង់ទឹកស្អាតប្រចាំថ្ងៃអតិបរមា។

(សូមមើល តារាង 2 សម្រាប់សេចក្តីពន្យល់ខាងលើ)

(4) **ថ្លៃដើម និងថ្លៃផ្លាស់ប្តូរថ្មី:** ថ្លៃដើមប្រហាក់ប្រហែល បានត្រូវគណនាដោយផ្អែកលើការរចនា ប្រព័ន្ធដំបូង ដោយយោងលើគម្រោងស្រដៀងគ្នាមានទំហំដូចគ្នា ហើយថ្លៃផ្លាស់ប្តូរឧបករណ៍ មេកានិច និងអគ្គិសនី បានត្រូវគណនាដោយអាយុកាលរបស់វាក្នុងការរចនា។

(5) **ថ្លៃដំណើរការ និងថែទាំ (O&M)៖** ថ្លៃនេះផ្អែកលើផែនការរៀបប្រព័ន្ធដំបូង រួមមានការ ចំណាយលើបុគ្គលិកដែលគណនាយោងលើលទ្ធផលជាក់ស្តែង ថ្លៃថាមពលអគ្គិសនី ថ្លៃគីមី និងថ្លៃ ជួសជុលឧបករណ៍មេកានិច&អគ្គិសនីបន្ទាប់ពីបញ្ចប់ការសាងសង់ប្រព័ន្ធដំបូង។

(6) **ការវិភាគ Cost-benefit analysis ៖** ថ្លៃដើមសរុប (C) ជាតម្លៃសាងសង់ប្រព័ន្ធដំបូង និងតម្លៃ ឧបករណ៍មេកានិចនិងអគ្គិសនីផ្អែកលើអាយុកាលវាក្នុងការរចនា និងតម្លៃដំណើរការ&ថែទាំ លទ្ធផល ( ចំណូលសរុប (B)) ដែលបានពីគម្រោង ជាចំណូលពីការលក់ទឹក។ Net present values នៃ ថ្លៃដើមទាំងពីរ និងចំណូល ត្រូវគេគណនាសម្រាប់រយៈពេល 50 ឆ្នាំ បន្ទាប់ពីសាងសង់ប្រព័ន្ធចប់ ដំបូង។ អត្រា benefit-cost ratio (B/C) ត្រូវគេគណនាជាមួយ តម្លៃ NPVs។

(សូមមើល តារាង 1 សម្រាប់សេចក្តីពន្យល់ខាងលើនេះ)

**3. លទ្ធផល និងអនុសាសន៍**

លទ្ធផលសិក្សាដំបូង មានបង្ហាញក្នុង តារាង 2។ គេគួរតែកែសម្រួលតំបន់ចែកចាយទឹកស្អាត, ដែល ជាកត្តាសំខាន់មួយក្នុងកត្តាសំខាន់ៗដទៃទៀតក្នុងលក្ខខណ្ឌគម្រោងជំនួយឥតសំណង JICA ក្នុង ក្រុងពោធិសាត់, ដោយផ្អែកលើករណីលេខ 6 ដែលមានលទ្ធផលវិនិយោគខ្ពស់។ មូលហេតុនានា មាន ដូចខាងក្រោម៖

- អត្រានទ្ធផលបានសេវាទឹកស្អាតបច្ចុប្បន្នក្នុងក្រុងពោធិសាត់ គឺ 37.3%។ នាឆ្នាំ 2025 អត្រានេះ ត្រូវ គេប៉ាន់ស្មានថានឹងមានប្រហែល 70% ក្នុងករណីលេខ 1 លេខ 2 លេខ 6 និងលេខ 7។
- មានការលំបាកក្នុងការបញ្ឈប់តំបន់ទាំងមូលដែលស្នើដោយភាគីកម្ពុជា (ករណី 1)។ គេក៏មិនអាច បញ្ឈប់តំបន់ក្នុងករណីលេខ 2 ដែរ ក្នុងហេតុផលតម្លៃគម្រោង និងថវិកាជំនួយឥតសំណង JICA ។
- ដោយសន្មតថាការសាងសង់ដំបូងនៃប្រព័ន្ធផ្គត់ផ្គង់ទឹកស្អាត ស្ថិតក្រោមគម្រោងជំនួយឥត សំណង JICA នោះករណីលេខ 1, 2, 6, និង 7 នឹងមានអត្រា B/C >1។
- ជានិច្ចទៅ ការងារបណ្តាញបំពង់ចែកចាយទឹក គ្របដណ្តប់តម្លៃមួយភាគធំ នៃតម្លៃគម្រោង។ ក្នុង ករណីលេខ 6 បំពង់ចែកចាយទឹកស្អាត មានប្រវែង 3.4 ម/ម្នាក់ (1.5 ម/ម្នាក់ ចំពោះ 75 មម ឬ អង្កត់ផ្ចិតធំជាងនេះ)។ ប្រវែងនេះ ជាប្រវែងបណ្តាញចែកចាយក្នុងអតិថិជនម្នាក់ ដែលខ្លីបំផុត។ ដូច្នោះ ករណីលេខ 6 នេះ ជាផែនការដែលមានប្រសិទ្ធផលខ្ពស់បំផុត ទាក់ទងនឹងប្រវែងបំពង់ ហើយ លទ្ធផលវិនិយោគ ក៏សមរម្យធៀបនឹងករណីដទៃៗ។

តារាង 1 លទ្ធផលសិក្សាគំរូបនៃចែកចាយទឹកស្អាតដែលបានគ្រោង

	Case1	Case2	Case 3	Case 4	Case 5	Case 6	Case 7								
	គំរូបនៃប្រព័ន្ធកាត់អាទិភាពស្តើងដោយភាគីកម្ពុជា					គំរូបនៃប្រព័ន្ធកាត់ដោយផ្អែកលើប្រសិទ្ធភាពវិនិយោគ									
ការប្រៀបធៀប															
ចំនួនប្រជាជនទទួលបានសេវា (x1000 នាក់)*1	62.1	48.0	35.0	26.6	23.2	37.3	41.2								
អត្រាទទួលបានសេវា (%)*2	93.4	80.0	67.6	59.6	56.4	69.8	73.5								
<b>អត្រាទទួលបានសេវា (%) ក្នុងទីប្រជុំជន</b>	<b>100</b>	<b>91.1</b>	<b>81.8</b>	<b>75.8</b>	<b>75.8</b>	<b>84.9</b>	<b>88.4</b>								
បរិមាណផ្គត់ផ្គង់ប្រចាំថ្ងៃអតិបរមា (ម <sup>3</sup> /ថ្ងៃ)*1	11,000	8,500	6,200	4,700	4,100	6,600	7,300								
ចំនួនកំណត់លេខផ្ទះ (គំណ)*1	13,020	10,060	7,340	5,560	4,850	7,810	8,640								
ប្រវែងបំពង់ចែកចាយ (គម) (φ75 ឬធំជាងនេះ)*3	224.0 (121.0)	167.3 (83.3)	124.0 (66.0)	96.7 (48.7)	81.3 (37.3)	128.1 (57.1)	144.1 (68.1)								
ប្រវែងបំពង់ចែកចាយក្នុងអតិថិជនម្នាក់ (ម/ម្នាក់) (φ75ឬធំជាង)*4	3.6 (1.9)	3.5 (1.7)	3.5 (1.9)	3.6 (1.8)	3.5 (1.6)	3.4 (1.5)	3.5 (1.7)								
គណនា និងប្រៀបធៀប B/C															
(a): គម្រោងសាងសង់ដំបូងក្រោមបន្តការកសាងកម្ពុជា។ (b): គម្រោងសាងសង់ដំបូងក្រោមបន្តកង្វះនៃធនធានសំណង															
(a)-(b): ចំនួនបំណែងដោយជំនួសកសិកម្មសំណងដំបូង															
កម្រៃសរុប	ថ្លៃដើម និងថ្លៃសរុប (x 100 លានរៀល)	(a) 56.3	(b) 7.5	(a) 47.4	(b) 7.0	(a) 40.7	(b) 6.6	(a) 36.1	(b) 6.3	(a) 33.7	(b) 6.2	(a) 41.6	(b) 6.7	(a) 44.0	(b) 6.8
		<b>(a)-(b) 48.8</b>		<b>(a)-(b) 40.4</b>		<b>(a)-(b) 34.1</b>		<b>(a)-(b) 29.8</b>		<b>(a)-(b) 27.5</b>		<b>(a)-(b) 34.9</b>		<b>(a)-(b) 37.2</b>	
ចំណូលសរុប	ថ្លៃ O&M (x 100 លាន រៀល)*6	10.9	10.9	8.5	8.5	7.9	7.9	6.2	6.2	6.0	6.0	7.7	7.7	7.9	7.9
	សរុប (x 100 លាន រៀល) (C)	67.2	18.4	56.0	15.6	48.6	14.5	42.3	12.5	39.7	12.2	49.3	14.4	51.9	14.7
	ចំណូលសកទឹក (x100 លានរៀល)*7	25.5	25.5	19.7	19.7	14.4	14.4	10.9	10.9	9.5	9.5	15.3	15.3	16.9	16.9
	សរុប (x100 លាន រៀល) (B)	25.5	25.5	19.7	19.7	14.4	14.4	10.9	10.9	9.5	9.5	15.3	15.3	16.9	16.9
Benefit-cost ratio (B/C)	0.38	1.39	0.35	1.27	0.30	0.99	0.26	0.87	0.24	0.78	0.31	1.06	0.33	1.15	
សម្រាប់យោង: ថ្លៃដំឡើងកំណត់លេខផ្ទះ (x100 លាន រៀល)	1.6		1.2		0.9		0.7		0.6		1.0		1.1		
លទ្ធផលវាយតម្លៃ												Most recommendable			

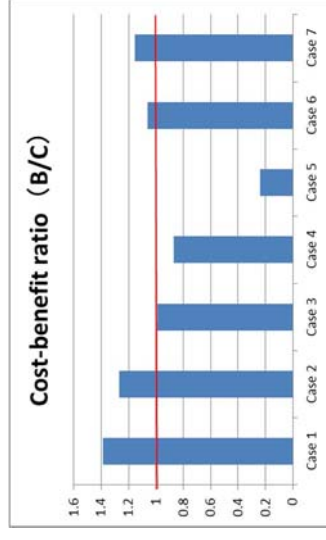
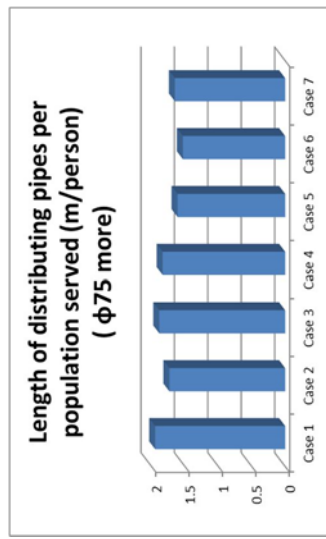
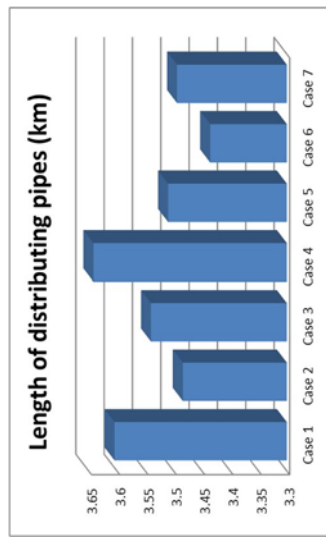
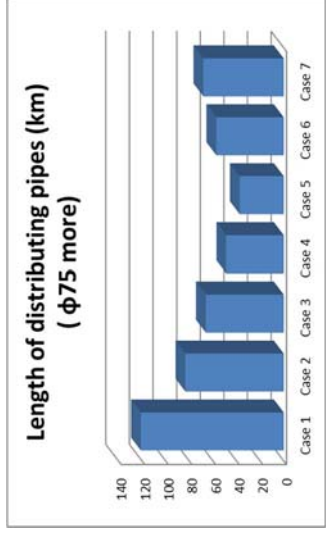
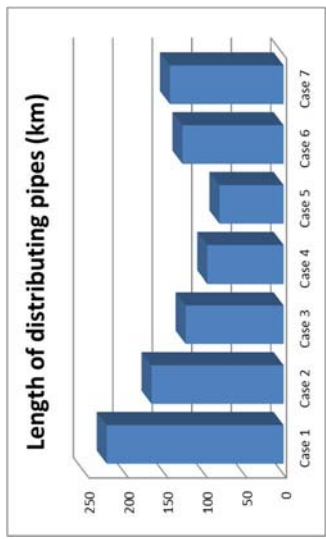
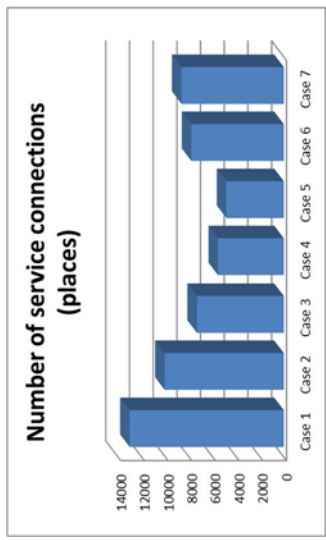
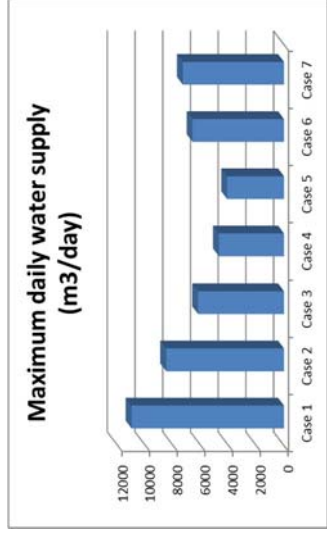
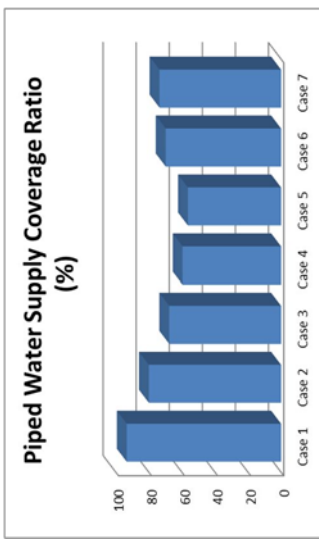
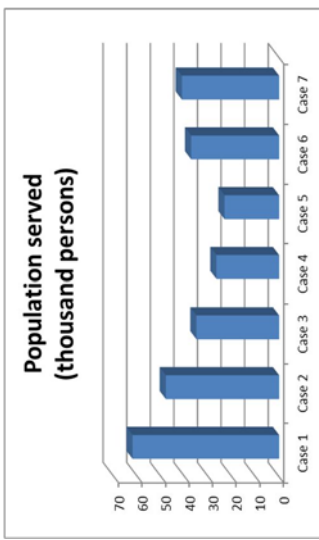
សម្គាល់

- \* 1 Increased population served (including existing water supply area), increased maximum daily supply volume and increased number of water supply pipe connections in extended water supply area (2016 - 2025)
- \* 2 Current population served: 36.3 thousand (2016) + increased water supply population (2016 to 2025) / population within the water supply area after extension / 105.4 thousand people (2025), current water supply coverage rate 37.7% (2016)
- \* 3 Approximate length of the water distribution pipe (including φ50). In parentheses, φ75 or more
- \* 4 Distribution pipe length / water supply population. In parentheses, the length of water distribution pipe (φ75 or more) / the population served
- \* 5 Initial and renewal cost: 1) Initial cost relating to water intake facilities, water conveyance facilities, water treatment facilities, and water distribution system with facilities capacity equivalent to the maximum daily water supply. Including cost of service connections and excluding land cost. 2) Renewal cost based on the design life (16 years) of mechanical and electrical equipment.
- \* 6 Operation and maintenance (O&M) costs: Personnel expenses, power costs, chemicals and repair expenses after the completion of initial water facilities construction
- \* 7 Water charges revenue: Revenues after completion of construction of initial water supply facilities

Highlight in yellow: +++      Good Highlight in orange: ++      highlight in Gray: +/NA

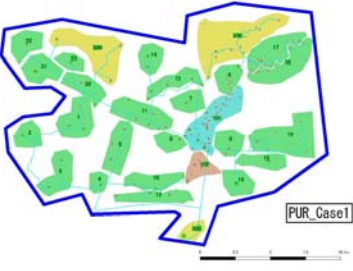

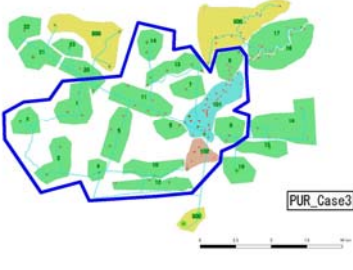
Remarks) Period of cost calculation: 50 years after completion of construction of the initial water supply facilities, construction period of the initial water supply facilities and initial project cost: 2 years, equally divided up to construction completion, present value of costs and benefits: discount rate 4%, 1 KHR = ¥ 0.02795, 1USD = ¥ 112.185 (2017/7)




**【 អ្នកប្រយោជន៍ 】**

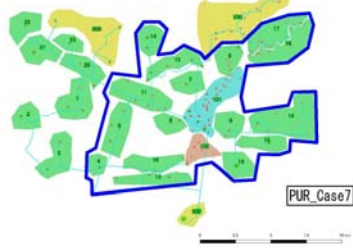




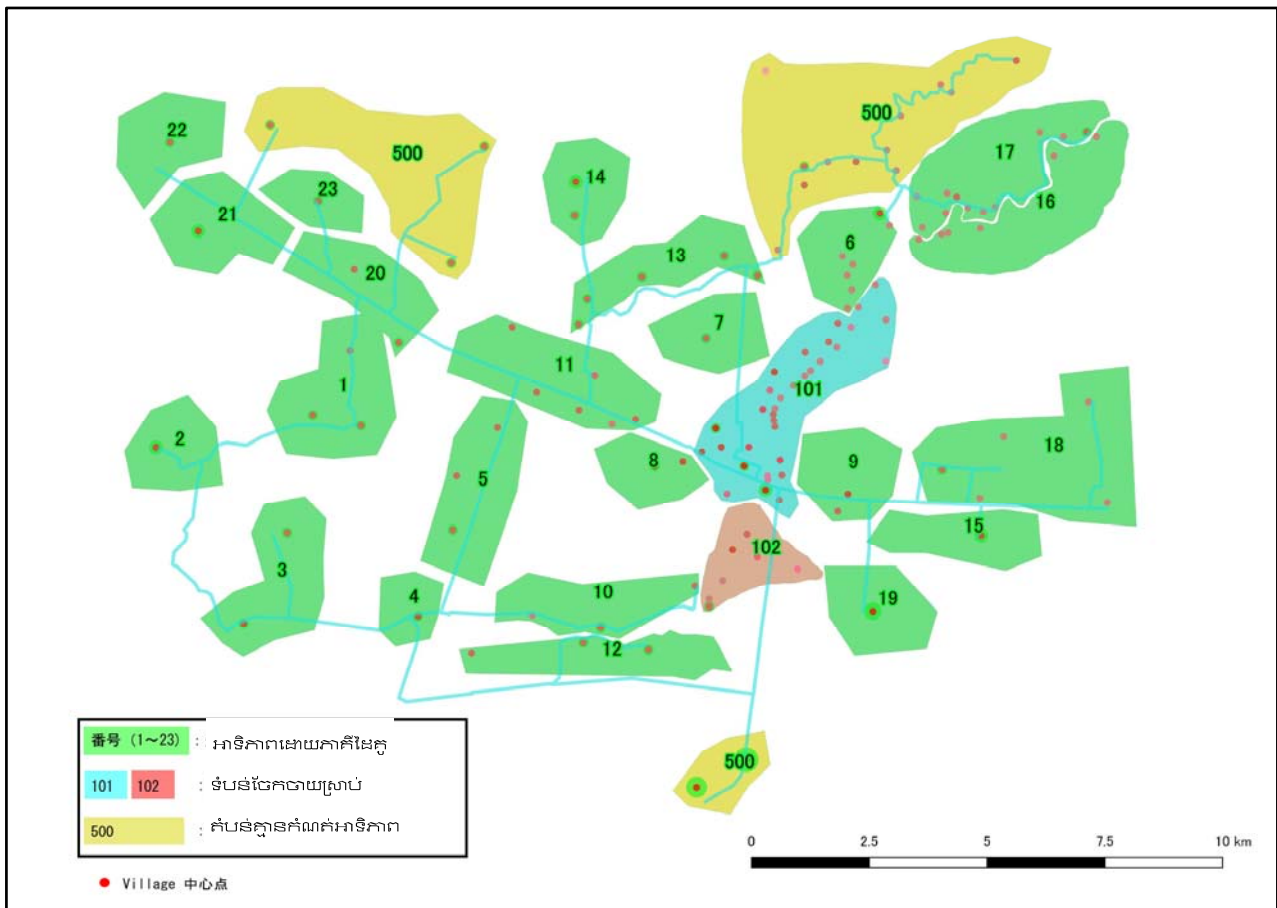
តារាង 2 ករណីនៃតំបន់ផ្គត់ផ្គង់ទឹកនិងកំណើនប្រជាជនក្នុងតំបន់ចែកចាយ, កំណើនបរិមាណទឹកផ្គត់ផ្គង់ប្រចាំថ្ងៃអតិបរិមា និងសង្ខេបផែនការប្រព័ន្ធផ្គត់ផ្គង់ទឹកស្អាត

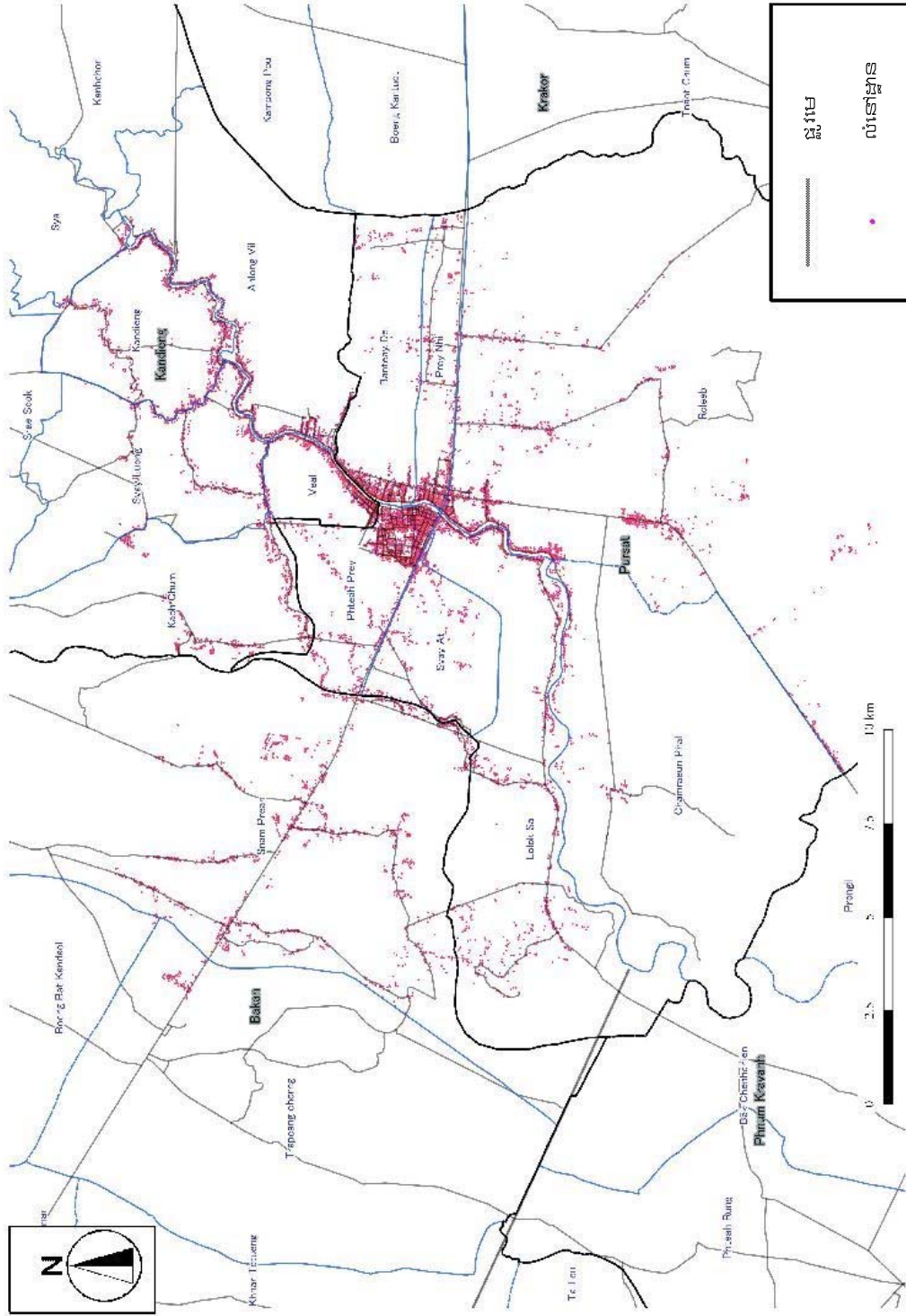
ករណីលេខ	តំបន់ចែកចាយ	កំណើនប្រជាជនក្នុងតំបន់ចែកចាយ, កំណើនបរិមាណទឹកផ្គត់ផ្គង់ប្រចាំថ្ងៃអតិបរិមា និងសង្ខេបផែនការប្រព័ន្ធផ្គត់ផ្គង់ទឹកស្អាត																							
1	 <p>PUR_Case1</p> <p>តំបន់ផ្គត់ផ្គង់ទឹក (បច្ចុប្បន្ននិងពង្រីក)</p> <p>តំបន់ផ្គត់ផ្គង់ ជាតំបន់ទាំងមូលដែលស្នើសុំដោយភាគីកម្ពុជា</p>	<p>Increased population served 62,100 persons</p> <p>Increased maximum daily water supply 11,000m<sup>3</sup>/day</p> <table border="1" data-bbox="766 369 1476 851"> <tr> <td rowspan="2">ស្ថានីយបូមទឹកនៅ</td> <td>អាការបូម</td> <td rowspan="2">12,100 m<sup>3</sup>/day</td> </tr> <tr> <td>អង្គការជ្រុងដំបូង</td> </tr> <tr> <td></td> <td>ម៉ាស៊ីនបូមទឹកនៅ</td> <td>4.2m<sup>3</sup>/min x 30m x 45kw x 3(1 stand-by) sets</td> </tr> <tr> <td>បណ្តាញបំពង់នាំទឹកនៅ</td> <td>បំពង់នាំទឹកនៅ</td> <td>φ450 x 7.8km</td> </tr> <tr> <td>រោងចក្រប្រព្រឹត្តិកម្មទឹក</td> <td>អាការប្រព្រឹត្តិកម្មទឹក</td> <td>Coagulation-sedimentation • rapid sand filtration method 11,000m<sup>3</sup>/day</td> </tr> <tr> <td rowspan="3">ប្រព័ន្ធចែកចាយទឹក</td> <td>អង្គស្តុកទឹកស្អាត</td> <td>1,800m<sup>3</sup> x 1 basin</td> </tr> <tr> <td>ម៉ាស៊ីនបូមចែកចាយ</td> <td>2.5m<sup>3</sup>/min x 50m x 30kw x 5(1 stand-by) sets</td> </tr> <tr> <td>បំពង់ចែកចាយ</td> <td>φ75~φ500x121km, φ50x103km Total 224km</td> </tr> <tr> <td>តំណចូលផ្ទះ</td> <td></td> <td>13,020 places</td> </tr> </table>	ស្ថានីយបូមទឹកនៅ	អាការបូម	12,100 m <sup>3</sup> /day	អង្គការជ្រុងដំបូង		ម៉ាស៊ីនបូមទឹកនៅ	4.2m <sup>3</sup> /min x 30m x 45kw x 3(1 stand-by) sets	បណ្តាញបំពង់នាំទឹកនៅ	បំពង់នាំទឹកនៅ	φ450 x 7.8km	រោងចក្រប្រព្រឹត្តិកម្មទឹក	អាការប្រព្រឹត្តិកម្មទឹក	Coagulation-sedimentation • rapid sand filtration method 11,000m <sup>3</sup> /day	ប្រព័ន្ធចែកចាយទឹក	អង្គស្តុកទឹកស្អាត	1,800m <sup>3</sup> x 1 basin	ម៉ាស៊ីនបូមចែកចាយ	2.5m <sup>3</sup> /min x 50m x 30kw x 5(1 stand-by) sets	បំពង់ចែកចាយ	φ75~φ500x121km, φ50x103km Total 224km	តំណចូលផ្ទះ		13,020 places
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2	 <p>PUR_Case2</p> <p>តំបន់ផ្គត់ផ្គង់ទឹក (បច្ចុប្បន្ននិងពង្រីក)</p> <p>ករណីនេះ តំបន់ផ្គត់ផ្គង់ទឹក យកតាមអាទិភាពផ្តល់ដោយភាគីកម្ពុជា, តំបន់ចែកចាយ តូចជាងករណីលេខ 1</p>	<p>Increased population served 48,000 persons</p> <p>Increased maximum daily water supply 8,500m<sup>3</sup>/ day</p> <table border="1" data-bbox="766 929 1476 1433"> <tr> <td rowspan="2">ស្ថានីយបូមទឹកនៅ</td> <td>អាការបូម</td> <td rowspan="2">9,350 m<sup>3</sup>/day</td> </tr> <tr> <td>អង្គការជ្រុងដំបូង</td> </tr> <tr> <td></td> <td>ម៉ាស៊ីនបូមទឹកនៅ</td> <td>3.2m<sup>3</sup>/min x 32m x 30kw x 3(1 stand-by) sets</td> </tr> <tr> <td>បណ្តាញបំពង់នាំទឹកនៅ</td> <td>បំពង់នាំទឹកនៅ</td> <td>φ400 x 7.8km</td> </tr> <tr> <td>រោងចក្រប្រព្រឹត្តិកម្មទឹក</td> <td>អាការប្រព្រឹត្តិកម្មទឹក</td> <td>Coagulation-sedimentation • rapid sand filtration method 8,500m<sup>3</sup>/day</td> </tr> <tr> <td rowspan="3">ប្រព័ន្ធចែកចាយទឹក</td> <td>អង្គស្តុកទឹកស្អាត</td> <td>1,500m<sup>3</sup> x 1 basin</td> </tr> <tr> <td>ម៉ាស៊ីនបូមចែកចាយ</td> <td>2.6m<sup>3</sup>/min x 50m x 30kw x 4(1 stand-by) sets</td> </tr> <tr> <td>បំពង់ចែកចាយ</td> <td>φ75~φ450 x 83.3km, φ50 x 84km Total 167.3km</td> </tr> <tr> <td>តំណចូលផ្ទះ</td> <td></td> <td>10,060 places</td> </tr> </table>	ស្ថានីយបូមទឹកនៅ	អាការបូម	9,350 m <sup>3</sup> /day	អង្គការជ្រុងដំបូង		ម៉ាស៊ីនបូមទឹកនៅ	3.2m <sup>3</sup> /min x 32m x 30kw x 3(1 stand-by) sets	បណ្តាញបំពង់នាំទឹកនៅ	បំពង់នាំទឹកនៅ	φ400 x 7.8km	រោងចក្រប្រព្រឹត្តិកម្មទឹក	អាការប្រព្រឹត្តិកម្មទឹក	Coagulation-sedimentation • rapid sand filtration method 8,500m <sup>3</sup> /day	ប្រព័ន្ធចែកចាយទឹក	អង្គស្តុកទឹកស្អាត	1,500m <sup>3</sup> x 1 basin	ម៉ាស៊ីនបូមចែកចាយ	2.6m <sup>3</sup> /min x 50m x 30kw x 4(1 stand-by) sets	បំពង់ចែកចាយ	φ75~φ450 x 83.3km, φ50 x 84km Total 167.3km	តំណចូលផ្ទះ		10,060 places
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3	 <p>PUR_Case3</p> <p>តំបន់ផ្គត់ផ្គង់ទឹក (បច្ចុប្បន្ននិងពង្រីក)</p> <p>ករណីនេះ តំបន់ផ្គត់ផ្គង់ទឹក យកតាមអាទិភាពផ្តល់ដោយភាគីកម្ពុជា, តំបន់ចែកចាយ តូចជាងករណីលេខ 2</p>	<p>Increased population served 35,000 persons</p> <p>Increased maximum daily water supply 6,200m<sup>3</sup>/ day</p> <table border="1" data-bbox="766 1523 1476 2004"> <tr> <td rowspan="2">ស្ថានីយបូមទឹកនៅ</td> <td>អាការបូម</td> <td rowspan="2">6,820 m<sup>3</sup>/day</td> </tr> <tr> <td>អង្គការជ្រុងដំបូង</td> </tr> <tr> <td></td> <td>ម៉ាស៊ីនបូមទឹកនៅ</td> <td>2.4m<sup>3</sup>/min x 33m x 30kw x 3(1 stand-by) sets</td> </tr> <tr> <td>បណ្តាញបំពង់នាំទឹកនៅ</td> <td>បំពង់នាំទឹកនៅ</td> <td>φ350 x 7.8km</td> </tr> <tr> <td>រោងចក្រប្រព្រឹត្តិកម្មទឹក</td> <td>អាការប្រព្រឹត្តិកម្មទឹក</td> <td>Coagulation-sedimentation • rapid sand filtration method 6,200m<sup>3</sup>/day</td> </tr> <tr> <td rowspan="3">ប្រព័ន្ធចែកចាយទឹក</td> <td>អង្គស្តុកទឹកស្អាត</td> <td>1,200m<sup>3</sup> x 1 basin</td> </tr> <tr> <td>ម៉ាស៊ីនបូមចែកចាយ</td> <td>1.9m<sup>3</sup>/min x 50m x 30kw x 4(1 stand-by) sets</td> </tr> <tr> <td>បំពង់ចែកចាយ</td> <td>φ75~φ400 x 66km, φ50 x 58km Total 124km</td> </tr> <tr> <td>តំណចូលផ្ទះ</td> <td></td> <td>7,340 places</td> </tr> </table>	ស្ថានីយបូមទឹកនៅ	អាការបូម	6,820 m <sup>3</sup> /day	អង្គការជ្រុងដំបូង		ម៉ាស៊ីនបូមទឹកនៅ	2.4m <sup>3</sup> /min x 33m x 30kw x 3(1 stand-by) sets	បណ្តាញបំពង់នាំទឹកនៅ	បំពង់នាំទឹកនៅ	φ350 x 7.8km	រោងចក្រប្រព្រឹត្តិកម្មទឹក	អាការប្រព្រឹត្តិកម្មទឹក	Coagulation-sedimentation • rapid sand filtration method 6,200m <sup>3</sup> /day	ប្រព័ន្ធចែកចាយទឹក	អង្គស្តុកទឹកស្អាត	1,200m <sup>3</sup> x 1 basin	ម៉ាស៊ីនបូមចែកចាយ	1.9m <sup>3</sup> /min x 50m x 30kw x 4(1 stand-by) sets	បំពង់ចែកចាយ	φ75~φ400 x 66km, φ50 x 58km Total 124km	តំណចូលផ្ទះ		7,340 places
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4	 <p>តំបន់ផ្គត់ផ្គង់ទឹក (បច្ចុប្បន្ននិងពង្រីក)</p> <p>ករណីនេះ តំបន់ផ្គត់ផ្គង់ទឹក យកតាមអាទិភាពផ្តល់ដោយភាគីកម្ពុជា, តំបន់ចែកចាយ តូចជាងករណីលេខ 3</p>	<p>Increased population served 26,600 persons</p> <p>Increased maximum daily water supply 4,700m<sup>3</sup>/ day</p> <table border="1" data-bbox="766 268 1476 761"> <tr> <td rowspan="2">ស្ថានីយបូមទឹកនៅ</td> <td>អាការបូម</td> <td rowspan="2">5,170 m<sup>3</sup>/day</td> </tr> <tr> <td>អាងពង្រឹងដំបូង</td> </tr> <tr> <td></td> <td>ម៉ាស៊ីនបូមទឹកនៅ</td> <td>1.8m<sup>3</sup>/min x 39m x 18.5kw x 3(1 stand-by) sets</td> </tr> <tr> <td>បណ្តាញបំពង់នាំទឹកនៅ</td> <td>បំពង់នាំទឹកនៅ</td> <td>φ300 x 7.8km</td> </tr> <tr> <td>រោងចក្រប្រព្រឹត្តកម្មទឹក</td> <td>អាការប្រព្រឹត្តកម្មទឹក</td> <td>Coagulation-sedimentation • rapid sand filtration method 4,700m<sup>3</sup>/day</td> </tr> <tr> <td rowspan="3">ប្រព័ន្ធចែកចាយទឹក</td> <td>អាងស្តុកទឹកស្អាត</td> <td>1,000m<sup>3</sup> x 1basin</td> </tr> <tr> <td>ម៉ាស៊ីនបូមចែកចាយ</td> <td>1.5m<sup>3</sup>/min x 50m x 22kw x 4(1 stand-by) sets</td> </tr> <tr> <td>បំពង់ចែកចាយ</td> <td>φ75-φ400 x 48.7km, φ50 x 48km Total 96.7 km</td> </tr> <tr> <td>តំណចូលផ្ទះ</td> <td></td> <td>5,560 places</td> </tr> </table>	ស្ថានីយបូមទឹកនៅ	អាការបូម	5,170 m <sup>3</sup> /day	អាងពង្រឹងដំបូង		ម៉ាស៊ីនបូមទឹកនៅ	1.8m <sup>3</sup> /min x 39m x 18.5kw x 3(1 stand-by) sets	បណ្តាញបំពង់នាំទឹកនៅ	បំពង់នាំទឹកនៅ	φ300 x 7.8km	រោងចក្រប្រព្រឹត្តកម្មទឹក	អាការប្រព្រឹត្តកម្មទឹក	Coagulation-sedimentation • rapid sand filtration method 4,700m <sup>3</sup> /day	ប្រព័ន្ធចែកចាយទឹក	អាងស្តុកទឹកស្អាត	1,000m <sup>3</sup> x 1basin	ម៉ាស៊ីនបូមចែកចាយ	1.5m <sup>3</sup> /min x 50m x 22kw x 4(1 stand-by) sets	បំពង់ចែកចាយ	φ75-φ400 x 48.7km, φ50 x 48km Total 96.7 km	តំណចូលផ្ទះ		5,560 places
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ករណីលេខ	តំបន់ចែកចាយ	កំណើនប្រជាជន/ផ្ទះកំបន់ចែកចាយ, កំណើនបរិមាណទឹកផ្គត់ផ្គង់ប្រចាំថ្ងៃអតិបរិមា និង សង្ខេបផែនការប្រព័ន្ធផ្គត់ផ្គង់ទឹកស្អាត																								
7	 <p>តំបន់ផ្គត់ផ្គង់ទឹក (បញ្ចូលនិងពង្រីក)</p> <p>សំណើរតំបន់ពង្រីក ផ្ដោតលើប្រសិទ្ធភាពវិនិយោគ តំបន់ផ្គត់ផ្គង់ទឹក ពង្រីកជំរុញករណីលេខ 6</p>	<p>Increased population served 41,200 persons</p> <p>Increased maximum daily water supply 7,300 m<sup>3</sup>/ day</p> <table border="1" data-bbox="766 268 1476 761"> <tr> <td rowspan="2">ស្ថានីយបូមទឹកនៅ</td> <td>អាការបូម</td> <td>8,030 m<sup>3</sup>/day</td> </tr> <tr> <td>អាងពង្រឹងដំបូង</td> <td></td> </tr> <tr> <td></td> <td>ម៉ាស៊ីនបូមទឹកនៅ</td> <td>2.8m<sup>3</sup>/min x 33m x 30kw x 3(1 stand-by) sets</td> </tr> <tr> <td>បណ្តាញបំពង់នាំទឹកនៅ</td> <td>បំពង់នាំទឹកនៅ</td> <td>φ450 x 7.8km</td> </tr> <tr> <td>រោងចក្រប្រព្រឹត្តកម្មទឹក</td> <td>អាការប្រព្រឹត្តកម្មទឹក</td> <td>Coagulation-sedimentation · rapid sand filtration method 7,300m<sup>3</sup>/day</td> </tr> <tr> <td rowspan="3">ប្រព័ន្ធចែកចាយទឹក</td> <td>អាងស្តុកទឹកស្អាត</td> <td>1,000m<sup>3</sup> x 1 basin</td> </tr> <tr> <td>ម៉ាស៊ីនបូមចែកចាយ</td> <td>2.2m<sup>3</sup>/min x 50m x 30kw x 4(1 stand-by) sets</td> </tr> <tr> <td>បំពង់ចែកចាយ</td> <td>φ75~φ300 x 68.1km, φ50 x 76km Total 144.1km</td> </tr> <tr> <td>តំណចូលផ្ទះ</td> <td></td> <td>8,640 places</td> </tr> </table>	ស្ថានីយបូមទឹកនៅ	អាការបូម	8,030 m <sup>3</sup> /day	អាងពង្រឹងដំបូង			ម៉ាស៊ីនបូមទឹកនៅ	2.8m <sup>3</sup> /min x 33m x 30kw x 3(1 stand-by) sets	បណ្តាញបំពង់នាំទឹកនៅ	បំពង់នាំទឹកនៅ	φ450 x 7.8km	រោងចក្រប្រព្រឹត្តកម្មទឹក	អាការប្រព្រឹត្តកម្មទឹក	Coagulation-sedimentation · rapid sand filtration method 7,300m <sup>3</sup> /day	ប្រព័ន្ធចែកចាយទឹក	អាងស្តុកទឹកស្អាត	1,000m <sup>3</sup> x 1 basin	ម៉ាស៊ីនបូមចែកចាយ	2.2m <sup>3</sup> /min x 50m x 30kw x 4(1 stand-by) sets	បំពង់ចែកចាយ	φ75~φ300 x 68.1km, φ50 x 76km Total 144.1km	តំណចូលផ្ទះ		8,640 places
ស្ថានីយបូមទឹកនៅ	អាការបូម	8,030 m <sup>3</sup> /day																								
	អាងពង្រឹងដំបូង																									
	ម៉ាស៊ីនបូមទឹកនៅ	2.8m <sup>3</sup> /min x 33m x 30kw x 3(1 stand-by) sets																								
បណ្តាញបំពង់នាំទឹកនៅ	បំពង់នាំទឹកនៅ	φ450 x 7.8km																								
រោងចក្រប្រព្រឹត្តកម្មទឹក	អាការប្រព្រឹត្តកម្មទឹក	Coagulation-sedimentation · rapid sand filtration method 7,300m <sup>3</sup> /day																								
ប្រព័ន្ធចែកចាយទឹក	អាងស្តុកទឹកស្អាត	1,000m <sup>3</sup> x 1 basin																								
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< សេចក្តីពន្យល់ផែនទីតំបន់គោលដៅនៃករណីនីមួយៗ (ជាឯកសារយោង)>





ផែនទីយោង៖ ស្ថានភាពរបស់នៅដ្ឋានក្នុងក្រុងពោធិសាត់

ប្រភព៖ ក្រុមសិក្សា JICA

តារាងរាយការណ៍ស្តីពីការអនុវត្តកម្មវិធីប្រយុទ្ធនឹងជំងឺគ្រុនចាញ់

លេខសំណួរ ១: ត្រូវបានបំពេញ ០: មិនបានបំពេញ

N°	District	Commune	VillageNumber	VillageName	Village Level Priority 1	Village Level Priority 2	Area classification	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7
1	1501Bakan	07_Snam Preah	15010715	Svay Att	99	11	Existing	1	1	1	1	1	1	1
2	1501Bakan	07_Snam Preah	15010712	Kam Preah Svay	8	5	Existing	1	1	1	1	1	1	1
3	1501Bakan	07_Snam Preah	15010707	Stock Svay	40	23	Extended	1	0	0	0	0	0	0
4	1501Bakan	07_Snam Preah	15010703	Ang Doung Sambour	99	500	Existing	1	0	0	0	0	0	0
5	1501Bakan	07_Snam Preah	15010711	Ang long Mean	99	500	Extended	1	0	0	0	0	0	0
6	1501Bakan	07_Snam Preah	15010717	Ang Doung Krasang	36	21	Extended	1	0	0	0	0	0	0
7	1501Bakan	07_Snam Preah	15010701	Snam Preah	35	20	Existing	1	1	0	0	0	0	0
8	1501Bakan	07_Snam Preah	15010716	A Rean	1	1	Extended	1	1	1	1	0	0	0
9	1501Bakan	07_Snam Preah	15010719	Chhlong Phleung	2	1	Extended	1	1	1	1	0	0	0
10	1501Bakan	07_Snam Preah	15010702	Kra Pear Rol	99	20	Extended	1	1	0	0	0	0	0
11	1501Bakan	07_Snam Preah	15010708	Keah Krasang	3	1	Extended	1	1	1	1	0	0	0
12	1501Bakan	07_Snam Preah	15010710	Dang Keab Kdam	17	5	Extended	1	1	1	1	1	1	1
13	1501Bakan	07_Snam Preah	15010714	Chhout Ta Cab	4	2	Extended	1	1	1	1	0	0	0
14	1501Bakan	07_Snam Preah	15010718	Bak Preh	99	500	Extended	1	0	0	0	0	0	0
15	1501Bakan	10_Trapang Chomg	15011018	Kdey Chhmoit	38	22	Extended	1	0	0	0	0	0	0
16	1502Kandieng	01_Anlong Vil	15020101	Toul Cha	99	101-102	Existing	1	1	1	1	1	1	1
17	1502Kandieng	01_Anlong Vil	15020102	Ou Bakom	99	101-102	Existing	1	1	1	1	1	1	1
18	1502Kandieng	01_Anlong Vil	15020103	Wat Por 1	99	101-102	Existing	1	1	1	1	1	1	1
19	1502Kandieng	01_Anlong Vil	15020104	Wat Por 2	99	101-102	Existing	1	1	1	1	1	1	1
20	1502Kandieng	01_Anlong Vil	15020107	Kancheut Baydak	99	101-102	Existing	1	1	1	1	1	1	1
21	1502Kandieng	01_Anlong Vil	15020108	Ang long Vil	99	16	Existing	1	1	0	0	0	0	0
22	1502Kandieng	01_Anlong Vil	15020109	Preak Ta Young	99	101-102	Existing	1	1	1	1	1	1	1
23	1502Kandieng	01_Anlong Vil	15020105	Kampong Kra bey	99	6	Extended	1	1	1	1	1	1	1
24	1502Kandieng	01_Anlong Vil	15020106	Phlou Kra bey	99	6	Extended	1	1	1	1	1	1	1
25	1502Kandieng	01_Anlong Vil	15020110	Preak Ta Kong	28	16	Extended	1	1	0	0	0	0	0
26	1502Kandieng	01_Anlong Vil	15020111	Keah Kra sang	28	16	Extended	1	1	0	0	0	0	0
27	1502Kandieng	01_Anlong Vil	15020112	Preak Chheut Trav	28	16	Extended	1	1	0	0	0	0	0
28	1502Kandieng	01_Anlong Vil	15020113	Chey Chom mas	28	16	Extended	1	1	0	0	0	0	0
29	1502Kandieng	01_Anlong Vil	15020114	Boeung Chhrouk	28	16	Extended	1	1	0	0	0	0	0
30	1502Kandieng	01_Anlong Vil	15020116	Kbal Ro mas	28	16	Extended	1	1	0	0	0	0	0

តារាងរាយការណ៍ស្តីពីការប្រកួតប្រជែងគ្នាស្រាប់តែការយកគ្រឹះស្ថានភាពស្រុក

លេខសំណួរ ១: ត្រូវបានបំប្លែងជាលេខ ០-១១ត្រូវបានបំប្លែងជាលេខ

N°	District	Commune	VillageNumber	VillageName	Village Level Priority 1	Village Level Priority 2	Area classification	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7
31	1502Kandiang	03_Kandiang	15020304	Kandiang Knoung	99	17	Existing	1	1	0	0	0	1	1
32	1502Kandiang	03_Kandiang	15020305	Kandiang	99	17	Existing	1	1	0	0	0	1	1
33	1502Kandiang	03_Kandiang	15020306	Station	99	17	Existing	1	1	0	0	0	1	1
34	1502Kandiang	03_Kandiang	15020307	Yous	99	17	Existing	1	1	0	0	0	1	1
35	1502Kandiang	03_Kandiang	15020302	Keo Vi chey	99	24	Existing	1	0	0	0	0	0	0
36	1502Kandiang	03_Kandiang	15020308	Prey Kdey leu	29	17	Existing	1	1	0	0	0	1	1
37	1502Kandiang	03_Kandiang	15020309	Prey Kdey Kandal	29	17	Existing	1	1	0	0	0	1	1
38	1502Kandiang	03_Kandiang	15020301	Kampong Roka	99	500	Extended	1	0	0	0	0	0	0
39	1502Kandiang	03_Kandiang	15020303	Svay Yeng	99	500	Extended	1	0	0	0	0	0	0
40	1502Kandiang	03_Kandiang	15020312	Bong Kol	99	500	Extended	1	0	0	0	0	0	0
41	1502Kandiang	03_Kandiang	15020313	Steung Leu	99	500	Extended	1	0	0	0	0	0	0
42	1502Kandiang	03_Kandiang	15020314	Steung Krom	99	500	Extended	1	0	0	0	0	0	0
43	1502Kandiang	03_Kandiang	15020315	Kampong Krassang leu	29	17	Extended	1	1	0	0	0	1	1
44	1502Kandiang	03_Kandiang	15020316	Kampong Krassang Krom	29	17	Extended	1	1	0	0	0	1	1
45	1502Kandiang	03_Kandiang	15020317	Boeing Chrouk	29	17	Extended	1	1	0	0	0	1	1
46	1502Kandiang	07_Svay Luong	15020701	Boeing Kranh	99	17	Existing	1	1	0	0	0	1	1
47	1502Kandiang	07_Svay Luong	15020702	Rong Machine	99	17	Existing	1	1	0	0	0	1	1
48	1502Kandiang	07_Svay Luong	15020703	Svay Luong	99	6	Existing	1	1	1	1	1	1	1
49	1502Kandiang	07_Svay Luong	15020704	Svay Chan	99	6	Existing	1	1	1	1	1	1	1
50	1502Kandiang	07_Svay Luong	15020705	Plouy portivong	9	6	Existing	1	1	1	1	1	1	1
51	1502Kandiang	07_Svay Luong	15020706	Svay Cham bok	99	500	Extended	1	0	0	0	0	0	0
52	1502Kandiang	07_Svay Luong	15020707	Por Leung	99	500	Extended	1	0	0	0	0	0	0
53	1502Kandiang	07_Svay Luong	15020708	Ko Kor	99	500	Extended	1	0	0	0	0	0	0
54	1502Kandiang	07_Svay Luong	15020709	San lot	99	500	Extended	1	0	0	0	0	0	0
55	1502Kandiang	07_Svay Luong	15020710	Svay Yeng	99	500	Extended	1	0	0	0	0	0	0
56	1502Kandiang	09_Yeal	15020901	Kbal Hong	99	101-102	Existing	1	1	1	1	1	1	1
57	1502Kandiang	09_Yeal	15020902	Bnlay Thom	99	101-102	Existing	1	1	1	1	1	1	1
58	1502Kandiang	09_Yeal	15020903	Veal	99	101-102	Existing	1	1	1	1	1	1	1
59	1502Kandiang	09_Yeal	15020904	Por Kambor	99	101-102	Existing	1	1	1	1	1	1	1
60	1502Kandiang	09_Yeal	15020905	Kanchout Baydak	99	6	Existing	1	1	1	1	1	1	1

តារាងរាយការណ៍ស្ថានភាពប្រព័ន្ធធានាសុវត្ថិភាពស្រូវ

លេខសំណួរ ១: ស្ថានភាពប្រព័ន្ធធានាសុវត្ថិភាពស្រូវ

No	District	Commune	VillageNumber	VillageName	Village Level Priority 1	Village Level Priority 2	Area classification	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7
61	1502Kandeng	09_Yeal	15020906	Por Dumnak	99	101-102	Existing	1	1	1	1	1	1	1
62	1502Kandeng	09_Yeal	15020907	Boeung Ya	99	6	Existing	1	1	1	1	1	1	1
63	1502Kandeng	09_Yeal	15020908	Ta Sdey	99	6	Existing	1	1	1	1	1	1	1
64	1502Kandeng	09_Yeal	15020909	Tout Pon Ro	99	13	Extended	1	1	1	0	0	1	1
65	1502Kandeng	10_Kaoh Chum	15021002	Bridge	25	13	Extended	1	1	1	0	0	1	1
66	1502Kandeng	10_Kaoh Chum	15021003	Dong Ron	99	13	Extended	1	1	1	1	0	1	1
67	1502Kandeng	10_Kaoh Chum	15021004	Dong Lon	26	14	Extended	1	1	1	1	0	0	1
68	1502Kandeng	10_Kaoh Chum	15021001	Ang long hab	25	13	Extended	1	1	1	1	0	1	1
69	1502Kandeng	10_Kaoh Chum	15021005	Stock Chhom	26	14	Extended	1	1	1	1	0	0	1
70	1505Sampov Meas	01_Chamraeum Phal	15050101	Leaw	24	12	Extended	1	1	1	1	0	0	1
71	1505Sampov Meas	01_Chamraeum Phal	15050103	Air Toung	24	12	Extended	1	1	1	1	0	0	1
72	1505Sampov Meas	01_Chamraeum Phal	15050107	Svay Meas	99	12	Extended	1	1	1	1	0	0	1
73	1505Sampov Meas	03_Lobok Sa	15050301	Por ta key	99	101-102	Existing	1	1	1	1	1	1	1
74	1505Sampov Meas	03_Lobok Sa	15050302	Preak Sdey	99	101-102	Existing	1	1	1	1	1	1	1
75	1505Sampov Meas	03_Lobok Sa	15050303	Lobok sa	99	10	Existing	1	1	1	1	1	1	1
76	1505Sampov Meas	03_Lobok Sa	15050305	Phsar Leu	15	10	Extended	1	1	1	1	1	1	1
77	1505Sampov Meas	03_Lobok Sa	15050304	Phum Kok	14	10	Extended	1	1	1	1	1	1	1
78	1505Sampov Meas	03_Lobok Sa	15050306	War Loung	7	4	Extended	1	1	1	1	1	1	1
79	1505Sampov Meas	03_Lobok Sa	15050307	Chhom rom siem	99	5	Extended	1	1	1	1	1	1	1
80	1505Sampov Meas	03_Lobok Sa	15050308	Dob Bat	6	3	Extended	1	1	1	1	1	1	0
81	1505Sampov Meas	03_Lobok Sa	15050310	Khmour	5	3	Extended	1	1	1	1	1	1	0
82	1505Sampov Meas	04_Phteah Prey	15050401	Peal nheak 1	99	101-102	Existing	1	1	1	1	1	1	1
83	1505Sampov Meas	04_Phteah Prey	15050402	Peal nheak 2	99	101-102	Existing	1	1	1	1	1	1	1
84	1505Sampov Meas	04_Phteah Prey	15050403	Khal Hong	99	101-102	Existing	1	1	1	1	1	1	1
85	1505Sampov Meas	04_Phteah Prey	15050405	North banana plantation	99	101-102	Existing	1	1	1	1	1	1	1
86	1505Sampov Meas	04_Phteah Prey	15050406	South banana plantation	99	101-102	Existing	1	1	1	1	1	1	1
87	1505Sampov Meas	04_Phteah Prey	15050407	On Sdav	23	11	Existing	1	1	1	1	1	1	1
88	1505Sampov Meas	04_Phteah Prey	15050410	Ra	99	101-102	Existing	1	1	1	1	1	1	1
89	1505Sampov Meas	04_Phteah Prey	15050408	Thmor Threat	24	11	Existing	1	1	1	1	1	1	1

តារាងរាយការណ៍ស្តីពីការស្រាវជ្រាវស្រុកស្រាវជ្រាវ

លេខស្រុក: ១; លេខស្រុក: ០; លេខស្រុក: ០

N°	District	Commune	VillageNumber	VillageName	Village Level Priority 1	Village Level Priority 2	Area classification	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7
90	1505Sampov Meas	04_Phteah Prey	15050409	Kork	99	13	Existing	1	1	1	0	0	1	1
91	1505Sampov Meas	04_Phteah Prey	15050404	Dong ka	10	7	Existing	1	1	1	1	1	1	1
92	1505Sampov Meas	05_Prey Nhi	15050501	Bak roteas	99	101-102	Existing	1	1	1	1	1	1	1
93	1505Sampov Meas	05_Prey Nhi	15050502	Doung Chhroum	99	101-102	Existing	1	1	1	1	1	1	1
94	1505Sampov Meas	05_Prey Nhi	15050503	Bralay Thom	99	101-102	Existing	1	1	1	1	1	1	1
95	1505Sampov Meas	05_Prey Nhi	15050504	Khal saen thmor	99	101-102	Existing	1	1	1	1	1	1	1
96	1505Sampov Meas	05_Prey Nhi	15050505	Man clear	13	9	Existing	1	1	1	1	1	1	1
97	1505Sampov Meas	05_Prey Nhi	15050507	Krang Ta Sen	30	18	Extended	1	1	0	0	0	1	1
98	1505Sampov Meas	05_Prey Nhi	15050506	Sala Kom rou	99	18	Extended	1	1	0	0	0	1	1
99	1505Sampov Meas	05_Prey Nhi	15050508	Sras Strong	31	18	Extended	1	1	0	0	0	1	1
100	1505Sampov Meas	06_Roleab	15050601	Por Andat	99	101-102	Existing	1	1	1	1	1	1	1
101	1505Sampov Meas	06_Roleab	15050604	Thnorl Bombreak	27	9	Existing	1	1	1	1	1	1	1
102	1505Sampov Meas	06_Roleab	15050605	Concrete bridge	99	101-102	Existing	1	1	1	1	1	1	1
103	1505Sampov Meas	06_Roleab	15050606	Chhloun kat	99	101-102	Existing	1	1	1	1	1	1	1
104	1505Sampov Meas	06_Roleab	15050607	Steung Toch	99	101-102	Existing	1	1	1	1	1	1	1
105	1505Sampov Meas	06_Roleab	15050611	Japan road	99	101-102	Existing	1	1	1	1	1	1	1
106	1505Sampov Meas	06_Roleab	15050602	Preak Orl mal	34	19	Existing	1	1	0	0	0	1	1
107	1505Sampov Meas	06_Roleab	15050609	Soriya leu	24	101-102	Existing	1	1	1	1	1	1	1
108	1505Sampov Meas	06_Roleab	15050610	Soriya krom	24	101-102	Existing	1	1	1	1	1	1	1
109	1505Sampov Meas	06_Roleab	15050613	Aur Plikouv	99	500	Extended	1	0	0	0	0	0	0
110	1505Sampov Meas	06_Roleab	15050608	Roleab	99	500	Extended	1	0	0	0	0	0	0
111	1505Sampov Meas	06_Roleab	15050612	Preak Thout	24	101-102	Extended	1	1	1	1	1	1	1
112	1505Sampov Meas	06_Roleab	15050603	Toul Makak	27	15	Extended	1	1	0	0	0	1	1
113	1505Sampov Meas	07_Svay At	15050702	Kran Pomlak	12	8	Existing	1	1	1	1	1	1	1
114	1505Sampov Meas	07_Svay At	15050703	Trang	99	11	Existing	1	1	1	1	1	1	1
115	1505Sampov Meas	07_Svay At	15050701	Station	99	8	Existing	1	1	1	1	1	1	1
116	1505Sampov Meas	07_Svay At	15050705	Ou Sdav	20	11	Existing	1	1	1	1	1	1	1
117	1505Sampov Meas	07_Svay At	15050704	Svat At	19	11	Existing	1	1	1	1	1	1	1
118	1505Sampov Meas	08_Bateay Dei	15050801	Ou Bakon leu	99	101-102	Existing	1	1	1	1	1	1	1
119	1505Sampov Meas	08_Bateay Dei	15050802	Ou Bakon Krom	99	101-102	Existing	1	1	1	1	1	1	1



តារាងរាយការណ៍ស្តីពីការកំណត់អាណត្តិរបស់ភូមិភាគកណ្តាល

លេខសំណួរ: 1. ត្រូវបានកំណត់ជាភូមិភាគកណ្តាល, 0- 1 ត្រូវបានកំណត់ជាភូមិភាគកណ្តាល

N°	District	Commune	VillageNumber	VillageName	Village Level Priority 1	Village Level Priority 2	Area classification	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7
120	1505Sampov Meas	08_Bateay Dei	15050803	Ou Bakon Kandal	99	101-102	Existing	1	1	1	1	1	1	1
121	1505Sampov Meas	08_Bateay Dei	15050804	Keo Sovann leu	99	101-102	Existing	1	1	1	1	1	1	1
122	1505Sampov Meas	08_Bateay Dei	15050805	Keo Sovann krom	99	101-102	Existing	1	1	1	1	1	1	1
123	1505Sampov Meas	08_Bateay Dei	15050807	Khal Hong	99	101-102	Existing	1	1	1	1	1	1	1
124	1505Sampov Meas	08_Bateay Dei	15050808	Bondous Sandteak	99	101-102	Existing	1	1	1	1	1	1	1
125	1505Sampov Meas	08_Bateay Dei	15050809	Onek Slam	99	101-102	Existing	1	1	1	1	1	1	1
126	1505Sampov Meas	08_Bateay Dei	15050810	Banteay dey leu	99	101-102	Existing	1	1	1	1	1	1	1
127	1505Sampov Meas	08_Bateay Dei	15050811	Banteay dey krom	99	101-102	Existing	1	1	1	1	1	1	1
128	1505Sampov Meas	08_Bateay Dei	15050812	Keo Mony	32	18	Extended	1	1	1	0	0	1	1
129	1505Sampov Meas	08_Bateay Dei	15050806	Ta Koy	99	18	Extended	1	1	1	0	0	1	1

Note) Village Level Priority 1: Priorities set by the Cambodian side (1 to 40, smaller numbers have higher priority), 99: No priority setting.

Village Level Priority 2: Village grouped according to Village Level Priority 1, the set priority (1 to 23, small numbers have high priority), 101 to 102 are Existing areas, 500: No priority setting.

ឧបសម្ព័ន្ធ 7.13

**របាយការណ៍តាមដានគម្រោង**

**Project Monitoring Report**  
**on**  
**Project Name**  
**Chapter 1. Grant Agreement No. XXXXXXXX**  
 20XX, Month

**Organizational Information**

<b>Signer of the G/A (Recipient)</b>	_____ Person in Charge (Designation) _____ _____ Contacts Address: _____ Phone/FAX: _____ Email: _____
<b>Executing Agency</b>	<b><u>Ministry of Industry and Handicraft (MIH)</u></b> Person in Charge <u>H.E. EK SONNCHAN, Secretary of State</u> <u>Ministry of Public Works and Transport</u> Contacts Address: <u>45, Preah Norodom Boulevard</u> Phone/FAX: <u>+855-97-77-11111</u> Email: <u>eksonnchan@hotmail.com</u>
<b>Line Ministry</b>	_____ Person in Charge (Designation) _____ _____ Contacts Address: _____ Phone/FAX: _____ Email: _____

**General Information:**

<b>Project Title</b>	The Project for Expansion of Water Supply Systems in Pursat
<b>E/N</b>	Signed date: Duration:
<b>G/A</b>	Signed date: Duration:
<b>Source of Finance</b>	Government of Japan: Not exceeding JPY _____ mil. Government of (_____): _____

## 1: Project Description

### 1-1 Project Objective

The overall goal of the project is to contribute to the social development through the expansion of water supply system in Pursat, Cambodia. The purpose of the project is as follows;

- 1) Improving living environment of the residents
- 2) Increasing house connections for the poor household

### 1-2 Project Rationale

- Higher-level objectives to which the project contributes (national/regional/sectoral policies and strategies)
- Situation of the target groups to which the project addresses

Ability of water supply to the residents in Pursat City is expanded by this project. The water supply coverage ratio of approximately 40% in 2016 in the controlled area of the Water Works will be risen to 73.9% in the target year:2025. The ratio in the urban area advocated by MIH becomes 86.5%. Increased benefit population is approximately 39,400 people. The additional daily average water supply volume and daily maximum water supply volume are approximately 5,500m<sup>3</sup>/day and 7,200m<sup>3</sup>/day respectively.

Although the Pursat City has an existing water supply system, the expansion of the system becomes the urgent matter for the further improvement of the water supply coverage ratio because the ratio remains in approximately 40% in 2016

MIH aims to work out 100% of the water supply coverage ratio in the urban area by 2025 by covering 90% with pipe water supply system and remaining 10% with other water supply system. This aim can be almost accomplished in the urban area within the administrative area of the Waterworks. This project also includes supplying equipment and materials to the poor households for house connection works conducted by the Cambodian side. Therefore, the consistency with the poverty reduction which is the greatest purpose in NPDS is ensured.

According to “Rolling Plan for the Royal Government of Cambodia, July 2017”, one of the important priority areas is “Promotion of Social Development” including “Program for Water Supply and Sewage System”. The implementation of this project has consistency with this Japan’s ODA policy.

### 1-3 Indicators for measurement of “Effectiveness”

Quantitative indicators to measure the attainment of project objectives		
Indicators	Original (Yr: 2016)	Target (Yr: 2025)
Dairy average water supply volume (m <sup>3</sup> /day)	5,464	10,900
Population served (Person)	38,436	77,800
Qualitative indicators to measure the attainment of project objectives		
➤ Improving living environment of the residents		
➤ Increasing house connections for the poor household		

## 2: Details of the Project

### 2-1 Location

Components	Original <i>(proposed in the outline design)</i>	Actual
1. Intake Pump Station	(1) 220m upstream of Damnak Ampil HW	
2. Water Treatment Plant	(2) 8.3km downstream of intake point	

### 2-2 Scope of the work

Components	Original* <i>(proposed in the outline design)</i>	Actual*
1. Intake Facility, 7260m <sup>3</sup> /day	(1) Sedimentation pond: 3,630m <sup>3</sup> /day x 2 pond (2) Intake Pump Facility Pump Room with intake pump: (2.52m <sup>3</sup> /min x 3 sets) Personnel Office	
2. Conveyance Facility	(1) DCIP $\phi$ 350 x 8.3km (2) Bridge piggy-backed pipe: SP $\phi$ 350 x 4 sites	
3. Water Treatment Plant	(1) Receiving well (1Basin) Volume: 27.5m <sup>3</sup> , Retention Time: 5.5min (2) Mixing Well (1Basin) Volume: 9.27m <sup>3</sup> , Retention Time: 1.83min (3) Flocculation Basin (2Basin) Up-and-Down Roundabout Type (zigzag flow) (4) Sedimentation Basin (2Basin) Surface Loading: Q/A=18.0mm/min Mean Velocity (V): 0.08m/min (5) Rapid Sand Filter (4Basin) (Reference) Filtration Rate (V): 121m/day Backwash Method: Air Wash + Water Wash (6) Service Reservoir (2Basin) Effective Volume: 1,152m <sup>3</sup> (576m <sup>3</sup> ×2Basins) Retention Time: 8.4hours (7) Drainage Basin (2Basin) Volume: 228.8m <sup>3</sup> (114.4m <sup>3</sup> ×2Basins) (8) Drying Bed (4Bed) Effective Area: 536.8m <sup>2</sup> (9) Chemical Feeding Facilities (1Unit) (10) Power Generator Equipment (in Chemical Building) (1Unit)	

	<p>Capacity: 350KVA</p> <p>(11) Chemical Building (1Unit) 3Storey Building, Total Floor Area (A):425.8m<sup>2</sup></p> <p>(12) Administration Building (1Unit) 1 Story Building, Total Floor Area (A): 266.7m<sup>2</sup></p>	
4. Distribution Facility	<p>(1) Service Reservoir (inside new WTP) Capacity: V=1,100 m<sup>3</sup>×2</p> <p>(2) Distribution Pump Facilities (inside new WTP) Horizontal Volute Pump 3.5m<sup>3</sup>/min (3 Pumps)</p> <p>(3) Distribution Mains (DCIP: T type) φ450mm L= 5.8km / φ400mm L= 1.6km / φ350mm L= 5.5km / φ300mm L= 0.8km / φ250mm L= 6.6km (HDPE) φ200mm L= 8.9km / φ150mm L= 27.5km / φ100mm L= 18.6km / φ 80mm L= 11.7km / φ 50mm L= 28.5km</p> <p>(4) Water Main Bridge (Steel Pipe) φ200mm 3 Places / φ 80mm 1 Place</p> <p>(5) Bridge-piggybacked Water Main (Steel Pipe) φ400mm 3 Places / φ350mm 8 Places / φ300mm 1 Place / φ250mm 8 Places / φ200mm 2 Places / φ150mm 11 Places / φ100mm 6 Places / φ 80mm 9 Places / φ 50mm 1 Place</p> <p>(6) Monitoring equipment of water distribution (ILS)</p>	
5. Procurement of equipment	<p>(1) Sediment evacuation equipment for existing intake pit Sand pump, Generator</p> <p>(2) Equipment for Water quality management Jar tester, distilled water maker, pH meter, residual chlorine meter, conductance meter, water bath, microscope, continuous water quality analyzer for conductivity and residual chlorine, absorptiometer, UPS,</p>	

	microorganism analyzer, reagents, glassware, laboratory table etc. (3) Tools for Mechanical Equipment Clamp Power Meter, Vibration Checker, Mechanical Torque Wrench, Portable Ultrasonic Flow meter, Sieve Shaking Machine (4) Equipment for management of distribution pipes Butt Fusion Machine for PE Pipes (5) Equipment and materials for house connection to poor households Water supply pipes, water meters and accessories (6) Accounting system SUMS system (PC and extra software license)	
6. Soft Component	(1) Formulating and learning work procedures for new facilities (2) Distribution flow monitoring (3) Ensuring quality of service connection installations (4) Promotion of applications for service connections (5) Improvement of production management Creation and revision of SOP	
7. Consulting Services	Detailed design, bidding assistance and construction supervision	

Reasons for modification of scope (if any).

(PMR)

### 2-3 Implementation Schedule

Items	Original		Actual
	<i>(proposed in the outline design)</i>	<i>(at the time of signing the Grant Agreement)</i>	
Cabinet approval	09/2018		
E/N	10/2018		
G/A	10/2018		
Detail Design	11/2018-04/2019		
Tender Notice	05/2019		
Tender	08/2019		
Award to Contract	09/2019		
Completion of Contract	10/2021		
Defect Liability Period	09/2022		
Project Completion	09/2022		

Reasons for any changes of the schedule, and their effects on the project (if any)

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**2-4 Obligations by the Recipient****2-4-1 Progress of Specific Obligations**

See Attachment 2.

**2-4-2 Activities**

See Attachment 3.

**2-4-3 Report on RD**

See Attachment 11.

**2-5 Project Cost****2-5-1 Cost borne by the Grant (Confidential until the Bidding)**

Components			Cost(Million Yen)	
	Original (proposed in the outline design)	Actual (in case of any modification)	Original <sup>1),2)</sup> (proposed in the outline design)	Actual
Construction Facilities	1. Intake Facilities 2. Water Treatment Plant 3. Water Conveyance and Distribution Pipes			
Equipment	1. Water Quality Analysis Equipment 2. Tools for Mechanical Equipment 3. Accounting System Equipment 4. Service Connection Installations			
Consulting Services	1. Detailed Design 2. Construction Supervision 3. Soft Component			
Total				

Note: 1) Date of estimation: June, 2018

2) Exchange rate: 1 US Dollar = 112.05 Yen

**2-5-2 Cost borne by the Recipient**

Components			Cost (USD)	
	Original (proposed in the outline design)	Actual (in case of any modification)	Original <sup>1)</sup> (proposed in the outline design)	Actual
1	Land leveling for the Intake and WTP		437,305	
2	Rental Cost for Temporary Yard		49,978	
3	UXO Survey for Temporary Yard		20,527	
4	Environmental Monitoring for Noise, Vibration and Treatment of Dry Sludge		8,925	
5	Contracting process of broadband LAN connection for the distribution information system		4,463	
6	Transmission of electricity to the Intake facilities and WTP		51,763	
7	Bank arrangement Charge and Commission of Authorization to Pay		22,313	
8	Installation of connection equipment for poor		74,551	



households (2,469 houses)			
		669,825	

Note: 1) Date of estimation: June, 2018

Reasons for the remarkable gaps between the original and actual cost, and the countermeasures (if any)

(PMR)

**2-6 Executing Agency**

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

**Original** (at the time of outline design)

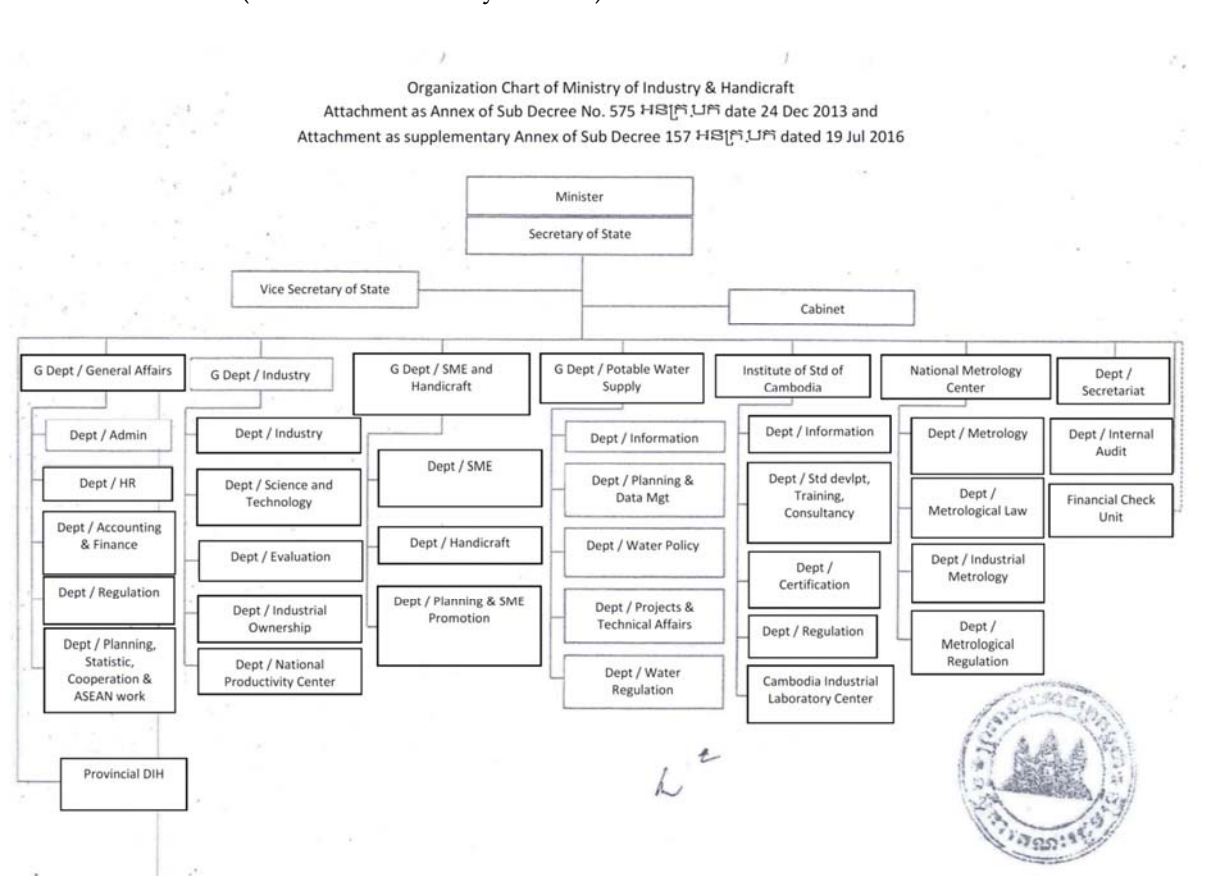
name: Ministry of Industry and Handicraft (MIH)

role:

financial situation:

institutional and organizational arrangement (organogram):

human resources (number and ability of staff):



**Actual** (PMR)

**2-7 Environmental and Social Impacts**

- The results of environmental monitoring based on Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- The results of social monitoring based on in Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- Disclosed information related to results of environmental and social monitoring to local stakeholders (whenever applicable).

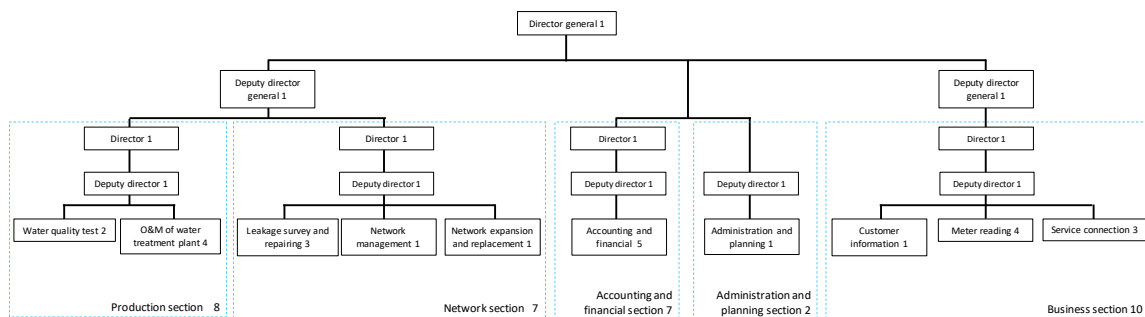
### 3: Operation and Maintenance (O&M)

#### 3-1 Physical Arrangement

- Plan for O&M (number and skills of the staff in the responsible division or section, availability of manuals and guidelines, availability of spareparts, etc.)

**Original** (at the time of outline design)

Current organization of Pursat Waterworks is shown below;



**Actual** (PMR)

#### 3-2 Budgetary Arrangement

- Required O&M cost and actual budget allocation for O&M

**Original** (at the time of outline design)

Outline of Profit and Loss (PL) Statement in Pursat Waterworks in 2016 is shown below

(Unit: Riel)

Revenue		Expense	
Water Sales	2,948,433,600	Personnel	422,021,596
Other Revenue	233,577,886	Material/Chemical	262,716,400
Revenue Total	3,182,011,486	Electricity/Fuel	617,794,518
		Depreciation	598,402,787
		Interest Payment	22,202,043
		Taxes	46,539,351
		Other	503,525,534
		Expense Total	2,473,202,229
Net Profit			708,809,257

**Actual** (PMR)

#### 4: Potential Risks and Mitigation Measures

- Potential risks which may affect the project implementation, attainment of objectives, sustainability
- Mitigation measures corresponding to the potential risks

##### Assessment of Potential Risks (at the time of outline design)

Potential Risks	Assessment
1. To complete the investigation and removal of UXO and Mines in all construction and temporary areas	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	The clearance of UXO/Mines for the construction area is essential for the project commencement. Without the clearance of UXO/Mines, the construction work will not be started.
	Mitigation Measures:
	Discussing the clearance of UXO/Mines in well advance, and to ask the clearance completed prior to the bidding announcement as "Major Undertakings to be taken by the Government of Cambodia".
	Action required during the implementation stage:
	The clearance of UXO/Mines required prior to the bidding announcement.
	Contingency Plan (if applicable):
The delay of UXO clearance causes the contractor's claims. Therefore, in case UXO clearance may be delayed, the timing of bidding shall be postponed.	
2. To secure and clear the temporary construction yard near the Project area	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	The temporary yard will be required prior to the bidding announcement to commence the construction work smoothly.
	Mitigation Measures:
	Discussion of the temporary construction yard in well advance so that the securing of the yard could complete prior to the bidding announcement.
	Action required during the implementation stage:
	The securing of the temporary construction yard is required prior to the bidding announcement.
	Contingency Plan (if applicable):
The delay of UXO clearance causes the contractor's claims. Therefore, in case UXO clearance may be delayed, the timing of bidding shall be postponed.	
3. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:

	Action required during the implementation stage:
	Contingency Plan (if applicable):
<b>Actual Situation and Countermeasures</b>	
(PMR)	

## 5: Evaluation and Monitoring Plan (after the work completion)

### 5-1 Overall evaluation

Please describe your overall evaluation on the project.

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### 5-2 Lessons Learnt and Recommendations

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

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### 5-3 Monitoring Plan of the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/ department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

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Attachment

1. Project Location Map
2. Specific obligations of the Recipient which will not be funded with the Grant
3. Monthly Report submitted by the Consultant
- Appendix - Photocopy of Contractor's Progress Report (if any)
  - Consultant Member List
  - Contractor's Main Staff List
4. Check list for the Contract (including Record of Amendment of the Contract/Agreement and Schedule of Payment)
5. Environmental Monitoring Form / Social Monitoring Form
6. Monitoring sheet on price of specified materials (Quarterly)
7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (PMR (final)only)
8. Pictures (by JPEG style by CD-R) (PMR (final)only)
9. Equipment List (PMR (final)only)
10. Drawing (PMR (final)only)
11. Report on RD (After project)

Attachment 1 Project Location Map



**Attachment 2 Specific obligations of the Government of Cambodia which will not be funded with the Grant**

(1) Before the Tender

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To open bank account (B/A)	within 1 month after the signing of the G/A	MEF	\$4,463	
2	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the consultant	within 1 month after the signing of the contract(s)	MIH		
3	To approve IEIA (Conditions of approval should be fulfilled, if any) and secure the necessary budget for implementation	within 1 month after the signing of the G/A	MIH		
4	To contract land lease in order to secure the temporary yard	before notice of the bidding document(s)	MIH	\$49,978	
5	To obtain the planning, zoning, building permit	before notice of the bidding document(s)	MIH		
6	To clear, level and reclaim the following sites 1) Embankment at proposed water treatment plant site and intake pump station site 2) To explore landmines and UXO at construction site and temporary yard	before notice of the bidding document(s)	MIH	\$437,305	
			MIH	\$20,527	
7	To submit Project Monitoring Report (with the result of Detail Design)	before preparation of bidding document(s)	MIH		

(2) During the Project Implementation

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the Supplier(s)	within 1 month after the signing of the contract(s)	MIH	\$4,463	
2	To bear the following commissions to a bank in Japan for the banking services based upon the B/A				

NO	Items	Deadline	In charge	Estimated Cost	Ref.
	1) Advising commission of A/P	within 1 month after the signing of the contract(s)	MIH		
	2) Payment commission for A/P	every payment	MEF	\$13,387	
3	To ensure prompt unloading and customs clearance at ports of disembarkation in Cambodia and to assist the Supplier(s) with internal transportation therein	during the Project	MIH		
4	To accord Japanese physical persons and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the Cambodia and stay therein for the performance of their work	during the Project	MEF		
5	To ensure that customs duties, VAT, internal taxes and other fiscal levies which may be imposed in Cambodia with respect to the purchase of the products and/or the services be exempted by its designated authority without using the Grant;	during the Project	MEF		
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project	during the Project			
7	1) To submit Project Monitoring Report	every month	MIH		
	2) To submit Project Monitoring Report (final)	within one month after signing of Certificate of Completion for the works under the contract(s)	MIH		
8	To submit a report concerning completion of the Project	within six months after completion of the Project	MIH		
9	To get permit for construction of temporary access bridges for laying water pipes and lease necessary land for approach road to the temporary access bridges (if necessary)	1 month before the start of the construction	Local Communities, MIH		



NO	Items	Deadline	In charge	Estimated Cost	Ref.
10	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the site(s)				
	1) Electricity The distributing line to the site	before start of the construction	MIH	\$51,763	
	2) Information System Contracting process of broadband LAN connection for the distribution information system	2 months before completion of the construction	MIH	\$4,463	
11	To take necessary measure for safety construction - traffic control - rope off	during the construction	MIH		
12	To implement EMP and EMoP	during the construction	MIH		
13	To submit results of environmental monitoring to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report	during the construction	MIH		
14	To obtain permission for occupancy of roads for the pipe laying work	before start of the construction for conveyance, transmission and distribution pipes	MIH (PWW <sup>1</sup> )		
15	To obtain all permissions required for the project implementation such as construction permission for intake facility and water treatment facility	before start of the construction	MIH (PWW)		
16	To recruit new staff members who are necessary for the operation of new system	up to the end of 2025	MIH (PWW)		
17	To establish the construction scheme for the new service pipe connections, including hiring temporary work force. To carry out the technical guidance, budgeting, planning and publicity for enhancing new connections.	up to the end of 2025	MIH (PWW)		

<sup>1</sup> PWW: Provincial Waterworks

NO	Items	Deadline	In charge	Estimated Cost	Ref.
18	To identify poor household (planning households is 2,469) <sup>2</sup>	up to the end of 2025	MIH (PWW)		

(3) After the Project

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To implement EMP and EMoP	for a period based on EMP and EMoP	MIH	\$8,925	
2	To submit results of environmental monitoring to JICA, by using the monitoring form, semiannually - The period of environmental monitoring may be extended if any significant negative impacts on the environment are found. The extension of environmental monitoring will be decided based on the agreement between MIH and JICA.	for 3 years after the Project	MIH		
3	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection	after completion of the construction	MIH		
4	To work for service pipe connection (planned number of households (HHs) is 7,544) The implementation plan is about 1,510 connections per year after completion. (Maximum is 1,670 connections per year). (in 2021: 1,433HHs, in 2022: 1,528HHs, in 2023: 1,595HHs, in 2024: 1,672HHs, in 2025: 1,316HHs) 1) Establishment of construction scheme including hiring temporary staff for service connection work, providing guidance, budgeting, planning and publicity for enhancing new connections.	up to the end of 2025	MIH (PWW)		
	2) Connection for the poor household (2,496 HHs) - Material is procured by Japanese side, connection work is conducted by Cambodian side. 3) Connection for household without poverty group (5,075 households)			\$74,521	

<sup>2</sup> Planning household number of 2,469 is an estimation referable in the section of 2-2-2-7 (5) in the draft final report. At the construction, PWW shall identify the target household.

	- Material and connection work is under responsibility of Cambodian side.				
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**Attachment 5 Environmental Monitoring Form / Social Monitoring Form**

1) Environmental Check List

Category	Environmental Item	Main Check Items	Yes: Y No : N	Specific Environmental and Social Considerations (Reason for Yes or No, rationale, mitigation measures, etc.)
1 Approvals, explanations	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) Y (b) Y (c) Y (d) Y	(a) IEIA is required. Preparation is in the process. It will be submitted in May 2018. (b) It will be approved after submission. (c) MOE will give all consents at approval of IEIA. (d) MIH obtained the permission of water extraction from Pursat River by MOWRAM.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) N	(a) All related departments of city hall understood the project purpose and contents, and they agreed on the implementation. At the public hearing, the villagers welcomed the project. They wished for the affordable price setting of connection and assistance to poor. There is no particular objection. (b) Disturbance on traffic was suspected, it will be solved by the setting of detour and information sharing of construction program.
	(3) Examination of Alternatives	(a) Have multiple alternative plans for the Project been analyzed? (Including analysis of items related to the environment/society.)	(a) Y	(a) Alternatives have been examined for the site selection of intake and WTP, and extent of the supply area.
2 Pollution Measures	(1) Air Quality	(a) Is there a possibility that chlorine from chlorine storage facilities and chlorine injection facilities will cause air pollution? Are any mitigating measures taken? (b) Do chlorine concentrations within the working environments comply with the country's occupational health and safety standards?	(a) N (b) Y	(a) The Project plans to use breaching power for disinfection. This reagent is stable, and occurrence of air pollution is considered less. The exhaust fan will be situated at the facilities of disinfection. (b) The above measures serve to keep appropriate working condition.

Category	Environmental Item	Main Check Items	Yes: Y No : N	Specific Environmental and Social Considerations (Reason for Yes or No, rationale, mitigation measures, etc.)
	(2) Water Quality	(a) Do pollutants, such as SS, BOD, COD contained in effluents discharged by the facility operations comply with the country's effluent standards?	(a) N/A	Discharge generated at the treatment process will be recycled, and sludge will be dried. Therefore, any effluent from treatment process will not be generated. Sewage will be treated by septic tanks and clear upper portion will be infiltrated into ground. Therefore, the discharge water is not generated.
	(3) Wastes	(a) Are wastes, such as sludge generated by the facility operations properly treated and disposed in accordance with the country's regulations?	(a) Y	(a) Sludge will be treated and dried at dry-bed, then dumped to the dumping yard prepared by the PWW.
	(4) Noise and vibration	(a) Do noise and vibrations generated from the facilities, such as pumping stations comply with the country's standards?	(a)Y	(a) The pump will be installed at basement made by the RC with the noise reducing walls. The noise will be controlled within the limit of RGC requirement. There is no standards of vibration, but it is controlled in permissible limit by the above measures.
	(5) Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(a)N	(a) The Project does not use groundwater.
3 Natural Environment	(1) Protected areas	(a) Is the project site or discharge area located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) There are no protected areas within the vicinity of the Project Site.
	(2) Ecosystems	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site or discharge area encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Is there a possibility that the amount of water used (e.g., surface water,	(a) N (b) N (c) N (d) N	(a) The site does not contain any virgin forests, tropical old-growth forests, or important ecological habitats. (b) No habitats for any rare species are present in the site. (c) No major concerns. (d) No major concerns

Category	Environmental Item	Main Check Items	Yes: Y No : N	Specific Environmental and Social Considerations (Reason for Yes or No, rationale, mitigation measures, etc.)
		groundwater) by project will adversely affect aquatic environments, such as rivers? Are adequate measures taken to reduce the impacts on aquatic environments, such as aquatic organisms?		
	(3) Hydrology	(a) Is there a possibility that the amount of water used (e.g., surface water, groundwater) by the project will adversely affect surface water and groundwater flows?	(a) N	(a) At the time of serious draught, the Pursat River had enough discharge to cover the intake amount for the project. Therefore, the hydrological impact is not significant.
4. Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Is the compensation going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a)N (b) N/A (c) N/A (d) N/A (e) N/A (f) N/A (g) N/A (h) N/A (i) N/A (j) N/A	(a) There will be no involuntary settlement, meaning that questions (b)-(j) are not applicable.
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that the amount of	(a) N (b) N	(a) The project has positive impact to improve basic human needs. There is no particular negative impact. (b) The Pursat River has enough discharge capacity and the

Category	Environmental Item	Main Check Items	Yes: Y No : N	Specific Environmental and Social Considerations (Reason for Yes or No, rationale, mitigation measures, etc.)
		water used (e.g., surface water, groundwater) by the project will adversely affect the existing water uses and water area uses?		intake of water supply does not affect significantly.
	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) No anthropological, historical, cultural, religiously important heritages or historical remains have been identified in the project site.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) The building location is in paddy field and residents are rare in the vicinity, therefore the impact on landscape is not significant.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) N/A (b) N/A	(a)(b) There are no ethnic minorities or indigenous peoples living near the project site.
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) Y (b) Y (c) Y (d) Y	(a) Adherence to laws concerning working conditions will be made explicit in contracts with contractors and managed. (b) Countermeasures such as installation of safety handrail are taken. (c) It will be achieved to set as an obligation of contractor in contract document. (d) Security guards will be included in target members of worker training.
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce	(a) Y (b)N (c) Y (d)N	(a) Mitigation measures will be taken under EPM for managing all noise, vibration, turbid water, dust, gas emissions, and waste discharged from the work site.

Category	Environmental Item	Main Check Items	Yes: Y No : N	Specific Environmental and Social Considerations (Reason for Yes or No, rationale, mitigation measures, etc.)
		<p>impacts?</p> <p>(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?</p> <p>(d) If the construction activities might cause traffic congestion, are adequate measures considered to reduce such impacts?</p>		<p>(b) Particular negative impact is not expected.</p> <p>(c) Temporary traffic disturbance will occur. The negative effect will be minimized by the measures such as setting of detour, assignment of traffic guide, installation of signboard, appropriate information sharing.</p> <p>(d) This is an expansion of the water supply and construction site is out of the city center. Therefore, serious traffic congestion is not expected.</p>
	(2) Monitoring	<p>(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?</p> <p>(b) What are the items, methods and frequencies of the monitoring program?</p> <p>(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?</p> <p>(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?</p>	<p>(a) Y</p> <p>(b) Y</p> <p>(c) Y</p> <p>(d) Y</p>	<p>(a) MIH is responsible for the monitoring as in previous similar project which they are experienced.</p> <p>(b) It will be determined in EMoP.</p> <p>(c) Monitoring by proponent is a part of usual operation activities. The training will be given as a part of soft component.</p> <p>(d) It is stipulated in the EMP.</p>
6 Focal points	Reference to Checklist of Other Sectors	<p>(a) Where necessary, pertinent items described in the Dam and River Projects checklist should also be checked.</p>	<p>(a) N</p>	<p>(a) The intake amount is not much, and the intake structure is small scale at the upper flow of existing headwork. Therefore, it is not necessary to refer the checklist of Dam and River Projects</p>
	Precautions when using the environmental checklist	<p>(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).</p>	<p>(a) N</p>	<p>(a) None</p>



2) Environmental Management Plan / Environmental Monitoring Plan

Impact	Parameter	Monitoring Method	Monitoring Point	Frequency	Responsibility
Construction					
Air Pollution	Dust	Visual observation	Vicinity of construction site	Daily	Contractor
	Exhaust gas	Inspection of registered vehicle	Construction Office	Monthly	Contractor
Noise and vibration	Working time	Working record	Construction site	Daily during construction	Contractor
	Management of vehicles	Inspection of registered vehicles	Construction Office	Monthly	Contractor
	Guidance to operator	Training record	Construction Office	Once during construction	Contractor
Water Pollution and sediment	Turbidity, oil	Visual inspection	Inlet of discharge	Weekly but daily during construction of foundation	Contractor
	Water quality	pH, EC, BOD, turbidity, oil	Inlet of discharge	When abnormal incident is observed	Contractor
Solid Waste (domestic)	Proper management	Visual inspection	Domestic waste	Weekly	Contractor
Solid Waste (Construction)	Proper dumping	Visual inspection	Temporary dumping yard	At the time of dumping	Contractor
	Preparation of dumping site	Contract document	Dumping site for soil waste	At the time of contract	PWW, MIH
Ecosystem	Ban of hunting and fishing	Training record	Construction Office	Monthly	Contractor
Hydrology	Construction schedule in rainy season	Monthly construction report	Construction Office	Monthly during rainy season	Contractor
Land and local resource usage	Lease of land	Contract document	Construction Office	At the time of contract of lease	PWW, MIH
Existing social infrastructure and services	Mitigation measures to prevent traffic disturbance	Monthly construction report	Construction Office	Monthly	Contractor
HIV/AIDS and other infectious disease	Management of occupational safety and hygiene	Monthly construction report	Construction Office	Monthly	Contractor
Working condition	Management of occupational safety and hygiene	Monthly construction report	Construction Office	Monthly	Contractor
Accident	Traffic plan of construction vehicle	Plan	Construction Office	At planning	Contractor
	Safety training	Monthly construction report	Construction Office	Monthly	Contractor
Miscellaneous	Complaint management	Analysis of complaint	Construction Office	Monthly	Contractor

Impact	Parameter	Monitoring Method	Monitoring Point	Frequency	Responsibility
Operation					
Waste	Appropriate treatment of sludge	Monitoring record	WTP	Every three months	PWW
	Preparation of dumping site for sludge	Contract document	PWW	At the time of contract	PWW
Noise and vibration	Monitoring with standard operating procedure (SOP)	SOP and monitoring record	Pumping station	Every three months	PWW
	Guidance for operators	Training record	Pumping station	Every three months	PWW

### 3) Environmental and Social Monitoring Form

#### Monitoring Form (Construction)

##### Construction site (Daily monitoring)

Monitoring Item		Procedure	Result	Measures to be taken	Reference standard	Frequency
Dust		Visual inspection			Acceptable or not	Daily
Noise		Sensory inspection			Acceptable or not	Daily
		Operation time check			Stated operation time in EMP	Daily
Water Quality (turbidity, oil)		Visual inspection			Acceptable or not	Daily (during foundation work)
Water Quality	pH	Laboratory test			5 - 7	Determined by the monitoring result
	EC				80	
	BOD				10	
	Turbidity				250	

##### Construction site (Weekly monitoring)

Monitoring Item	Procedure	Result	Measures to be taken	Reference standard	Frequency
Waste (Domestic)	Patrol			Acceptable or not	Weekly

##### Construction site (Monthly monitoring)

Monitoring Item	Procedure	Result	Measures to be taken	Reference standard	Frequency
Condition of construction machinery and vehicles	Maintenance record check			Acceptable or not (Exhaust gas, noise, vibration, and usual safety check)	
Traffic management	Patrol			Stated procedure in EMP	Monthly
Accident	Patrol			Acceptable or not	Monthly
Training and educational meeting to worker	Report check			Stated procedure in EMP (frequency, contents, target, etc.)	
Claim and comment	Report check			Acceptable or not	Monthly

##### Others

Monitoring Item	Procedure	Result	Measures to be taken	Reference standard	Frequency
Land for waste dumping Land for temporary use	Lease condition			Appropriate or not	Contract of lease
Plan of safety transportation	Plan check			Acceptable or not	At planning

Source: JICA Survey Team

#### Monitoring Form (Operation)

Monitoring Item	Procedure	Result	Measures to be taken	Reference standard	Frequency
Waste (treatment sludge)	Patrol			Appropriate or not	Monthly
Land for waste dumping	Procedure check			Appropriate or not	At contract agreement
Noise and vibration*	Patrol and maintenance			Normal condition or not	Daily

\*Noise and vibration of pump shall be checked in an operation record every day.

**Attachment 6 Monitoring sheet on price of specified materials**

1. Initial Conditions (Confirmed)

Items of Specified Materials	Initial Volume A	Initial Unit Price (¥) B	Initial total Price C=A×B	1% of Contract Price D	Condition of payment	
					Price (Decreased) E=C-D	Price (Increased) F=C+D
1 Item 1	●●t	●	●	●	●	●
2 Item 2	●●t	●	●	●		
3 Item 3						
4 Item 4						
5 Item 5						

2. Monitoring of the Unit Price of Specified Materials

(1) Method of Monitoring : ●●

(2) Result of the Monitoring Survey on Unit Price for each specified materials

Items of Specified Materials	1st month, 2015	2nd month, 2015	3rd month, 2015	4th	5th	6th
1 Item 1	●	●	●			
2 Item 2						
3 Item 3						
4 Item 4						
5 Item 5						

(3) Summary of Discussion with Contractor (if necessary)

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**Attachment 7 Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)**

(Actual Expenditure by Construction and Equipment each)

	Domestic Procurement (Recipient Country) A	Foreign Procurement (Japan) B	Foreign Procurement (Third Countries) C	Total D
Construction Cost	(A/D%)	(B/D%)	(C/D%)	
Direct Construction Cost	(A/D%)	(B/D%)	(C/D%)	
others	(A/D%)	(B/D%)	(C/D%)	
Equipment Cost	(A/D%)	(B/D%)	(C/D%)	
Design and Supervision Cost	(A/D%)	(B/D%)	(C/D%)	
Total	(A/D%)	(B/D%)	(C/D%)	

