Sydney Environmental & Soil Laboratory

Specialists in Soil Chemistry, Agronomy and Contamination Assessments

Landscape Package 4: Complete Soil Assessment

Batch N°: 9921
Sample No: 1

Report Status: ○ Draft ◉ Final

Quality ISO 9001

Sydney Environmental and Soil Laboratory Pty Limited ABN 70 106 810 708 PO Box 357, Pennant Hills NSW 1715 Australia T: 02 9980 6554 F: 02 9484 2427 E: info@sesl.com.au W: www.sesl.com.au

CLIENT DETAILS:

Ward Civil & Environmental Engineering P/L

PO Box 1067
NORTH RYDE BC NSW 1670

Attn: Emmanuel Mountakis

PROJECT DETAILS:

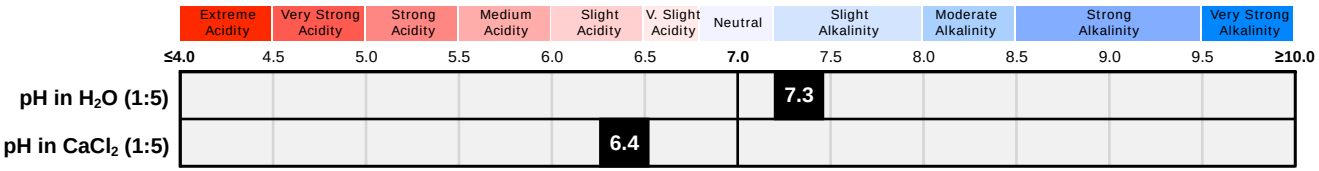
Project Name:
Pasminco Cell Revegetation
Location: Cockle Creek
SESL Quote N°:
Client Job N°: 543
Client Order N°:
Date Received: 16/04/2009

SAMPLE DETAILS:

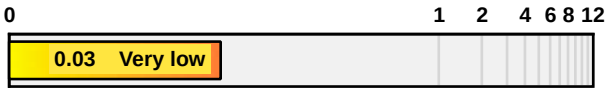
Sample Name:
Pitnacree Sample # 1 - Tree
Sample N°: 1
Sample Description:
Soil,
Test Type: SS02-L (MS), OM-WB, Disp (4419), Wet (4419), Tox (4419), Perm (4419), Large Particle (4419)

pH and ELECTRICAL CONDUCTIVITY

pH ANALYSIS



ELECTRICAL CONDUCTIVITY (dS/m)



SOLUBLE CATIONS (meq%)

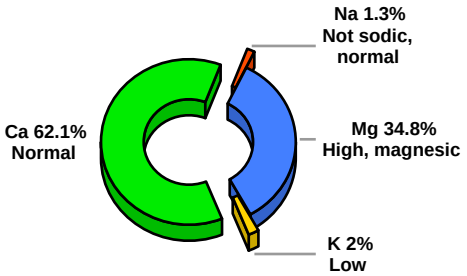
Na **K** **Ca** **Mg**

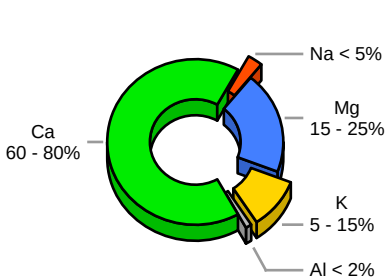
CHLORIDE (mg/kg)

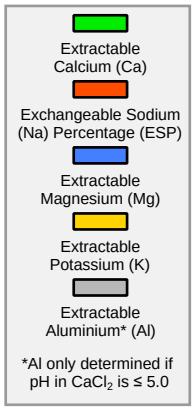
Only reported when EC (1:5) > 0.25 dS/m.

CATION BALANCE

BASE SATURATION PERCENTAGE (BSP)







CATION RATIOS

Exchangeable Sodium Percentage (ESP)	1.3% - Not sodic, normal				
Ca:Mg	2.9 Normal	**K:Mg**	0.1 Low	**Sodium Absorption Ratio**	ND

EFFECTIVE CATION EXCHANGE CAPACITY (eCEC)

(cmol⁺/kg or meq/100g)

CALCULATED LIME REQUIREMENT (CLR)*

Surface application rate:
0 kg/ha (ie. 0 g/m^2), based on treating a 150mm soil depth.

Volume application rate: 0 kg/m^3

CLR = Lime application required to reduce available Aluminium to 0. pH preference and cation ratios must also be considered when determining liming rate and product.

CALCULATED GYPSUM REQUIREMENT (CGR)*

Surface application rate:
2290 kg/ha (ie. 229 g/m^2), based on treating a 150mm soil depth.

Volume application rate: 1.5 kg/m^3

CGR = Gypsum application required to achieve 70% exchangeable Calcium. The CGR is corrected for any Lime addition specified in CLR.

* Calculation for kg/ha and g/m^2 is based on a Bulk Density of 1.3 and a soil depth of 150mm.

Date: 27/4/2009 **Sample Name:** Pitnacree Sample # 1 - Tree **Sample No.: 1 Batch No.: 9921**

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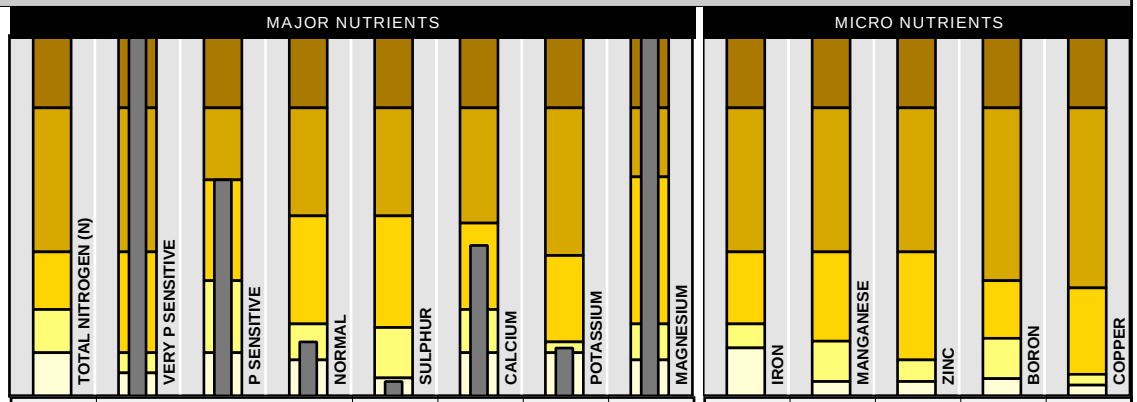
PLANT AVAILABLE NUTRIENT PROFILE



	NH_4+NO_3	Phosphorus as PO_4	Sulphur as SO_4	Ca	K	Mg	Fe	Mn	Zn	B	Cu
mg/kg	0	15	<5	2090	133	710	N.D.	N.D.	N.D.	D.N.T.	N.D.
kg/ha [1]	0	29	8	4076	259	1385	N.D.	N.D.	N.D.	D.N.T.	N.D.

NH_4 mgkg: <0.54

NO_3 mgkg: 0

Other notes & definitions

1 Calculation for kg/ha is based on a Bulk Density of 1.3 and a soil depth of 150mm.

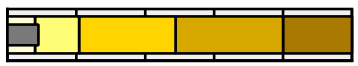
ND denotes Not Determined.

2 Determination of permeability in the laboratory is a guide only. Permeability in the field is influenced by many factors including, but not limited to, the level of compaction and the soil texture and structure.

Category	Description	Probability of response to a nutrient addition
Excessive	Potential phytotoxic response. No nutrient addition required. Drawdown is recommended.	<2
High	Nutrient level is more than adequate and luxury consumption may be occurring.	5-30
Sufficient	The most desirable category. Nutrient additions appropriate for most plants.	30-60
Low	Potential "hidden hunger" or subclinical deficiency.	60-90
Deficient	Growth is likely to be severely depressed and deficiency symptoms present.	>90

PHYSICAL DESCRIPTION

Organic Matter (% by mass):	Permeability [2] (cm/hr, Appendix H, AS4419 Method):	Particle Size Distribution (% by mass, AS4419 Method):	
2.09% Very Low	11.24 cm/hr Slow	< 10mm	71.93
		10 - 20mm	15.41
		> 20mm	12.66



Method References: pH, EC, Sol Cat, NO_3; Bradley et al (1983). **Exch Cat;** Method 15A1 Rayment and Higginson (1992). **PO_4;** Method 9E1 Rayment and Higginson (1992)
Texture, Clay Content/ Potential infiltration rate; AS4419 - 2003. **Structural Unit;** Chapman & Murphy (1991). **Aggregate Strength;** Sydney University (1982)
NH_4, SO_4, Fe, Mn, Cu, Zn; Method 83-1 to 83-5 Black (1983). **AS4454 Permeability, PSA;** AS4454 - 2003. **OM;** AS1289 – 1997

SUMMARY OF SOIL CHEMISTRY

pH	EC	Sodicity (ESP)	Ca:Mg	Ca % of eCEC
Slight alkalinity	Very low	Not sodic - normal	Normal	Normal

RECOMMENDATION

Dispersibility in H2O (1:5) : 3
Dispersibility in CaCl2 (1:5) : 1
Wettability : 600mm/min
Toxicity : 98mm

This soil was analysed to determine it's nutrient status for compliance to the Pasminco Cell Reveg Specification. The soil is of a slightly alkaline, non sodic nature and contains a highly magnesic and low potassium cation balance. Of the available nutrients, nitrogen, sulphur, calcium and potassium require amending. Organic matter levels meet Unit 19 but need further amendment to meet Unit 20 requirements. Also dispersibility, permeability and large particles need amendment to meet spec. requirements.

To amend the calcium, magnesium cation %, Ca:Mg ratio and dispersibility class, apply **Gypsum at 250g/sqm**. To improve the potassium cation %, apply **Muriate of Potash at 50g/sqm**. To improve the nitrogen level, apply **Urea at 15g/sqm.** Also the application of **Ag Sulphur at 30g/sqm** will contribute to sulphur levels and aid in acidifying the pH to meet spec requirements.

To further improve the large particles, permeability and organic matter results, apply a composted organic material that is low in phosphorus at 15%w/v.

Consultant: Paul Looby

Authorised Signatory: Murray Fraser

Report Date: 27 Apr 2009

Signature - required for Final Reports

Date: 27/4/2009 **Sample Name:** Pitnacree Sample # 1 - Tree **Sample No.: 1 Batch No.: 9921**

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Landscape Package 4: Complete Soil Assessment

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Report Status: ○ Draft ◉ Final

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Landscape Package 4: Complete Soil Assessment

Batch N°: 9921
Sample No: 2

Report Status: ○ Draft ◉ Final

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CLIENT DETAILS:

Ward Civil & Environmental Engineering P/L

PO Box 1067
NORTH RYDE BC NSW 1670

Attn: Emmanuel Mountakis

PROJECT DETAILS:

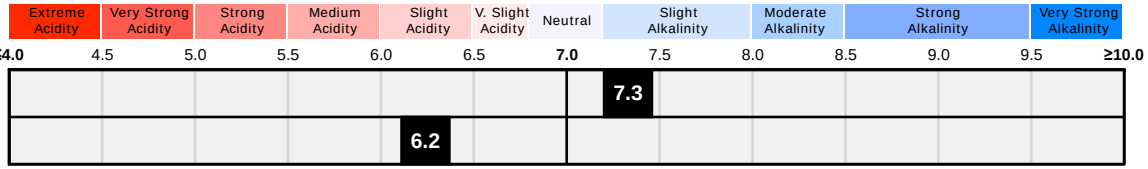
Project Name:
Pasminco Cell Revegetation
Location: Cockle Creek
SESL Quote N°:
Client Job N°: 543
Client Order N°:
Date Received: 16/04/2009

SAMPLE DETAILS:

Sample Name:
Pitnacree Sample # 2 - Levee Bank
Sample N°: 2
Sample Description:
Soil,
Test Type: SS02-L (MS), OM-WB, Disp (4419), Wet (4419), Tox (4419), Perm

pH and ELECTRICAL CONDUCTIVITY

pH ANALYSIS



ELECTRICAL CONDUCTIVITY (dS/m)

SOLUBLE CATIONS (meq%)

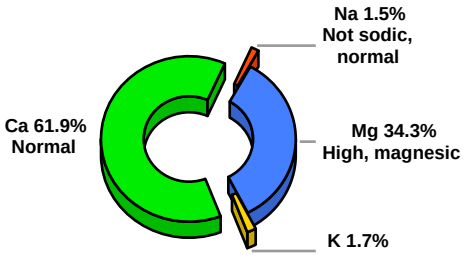
Na **K** **Ca** **Mg**

CHLORIDE (mg/kg)

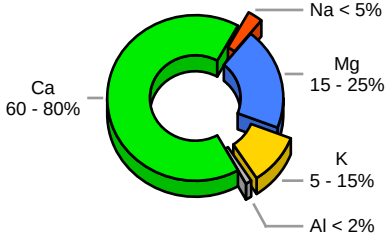
Only reported when EC (1:5) > 0.25 dS/m.

CATION BALANCE

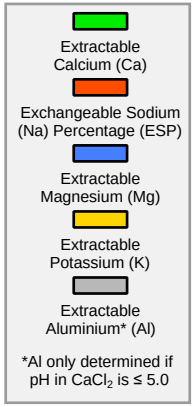
BASE SATURATION PERCENTAGE (BSP)



ACTUAL



IDEAL



*Al only determined if pH in $CaCl_2$ is ≤ 5.0

CATION RATIOS

Exhangeable Sodium Percentage (ESP)	1.5% - Not sodic, normal				
Ca:Mg	3 Normal	**K:Mg**	00 Low	**Sodium Absorption Ratio**	ND

EFFECTIVE CATION EXCHANGE CAPACITY (eCEC) ($cmol^+$/kg or meq/100g)

CALCULATED LIME REQUIREMENT (CLR)*

Surface application rate:
0 kg/ha (ie. 0 g/m^2), based on treating a 150mm soil depth.

Volume application rate: 0 kg/m^3

CLR = Lime application required to reduce available Aluminium to 0. pH preference and cation ratios must also be considered when determining liming rate and product.

CALCULATED GYPSUM REQUIREMENT (CGR)*

Surface application rate:
1280 kg/ha (ie. 128 g/m^2), based on treating a 150mm soil depth.

Volume application rate: 0.9 kg/m^3

CGR = Gypsum application required to achieve 70% exchangeable Calcium. The CGR is corrected for any Lime addition specified in CLR.

* Calculation for kg/ha and g/m^2 is based on a Bulk Density of 1.3 and a soil depth of 150mm.

Date: 27/4/2009 **Sample Name:** Pitnacree Sample # 2 - Levee Bank **Sample No.: 2 Batch No.: 9921**

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Landscape Package 4: Complete Soil Assessment

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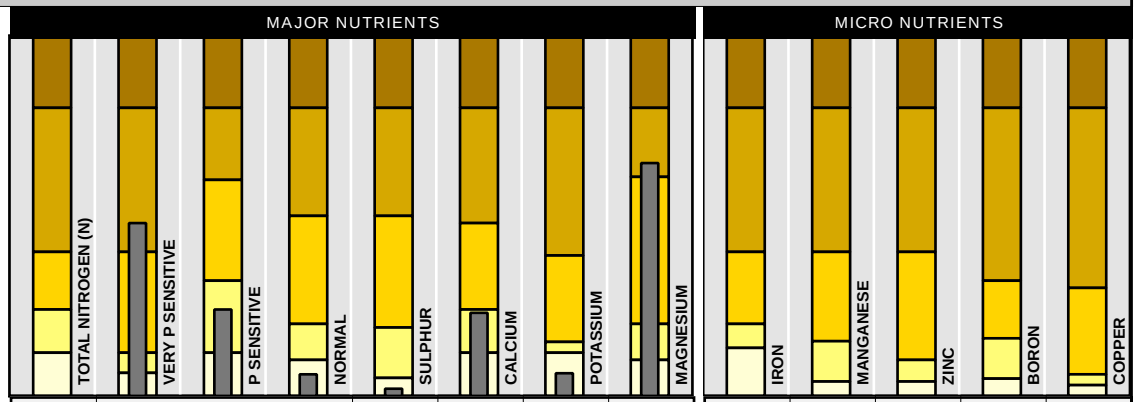
PLANT AVAILABLE NUTRIENT PROFILE



	NH_4+NO_3	Phosphorus as PO_4	Sulphur as SO_4	Ca	K	Mg	Fe	Mn	Zn	B	Cu
mg/kg	0	6	<5	1154	63	388	N.D.	N.D.	N.D.	D.N.T.	N.D.
kg/ha [1]	0	12	4	2250	123	757	N.D.	N.D.	N.D.	D.N.T.	N.D.

NH_4 mgkg: <0.54

NO_3 mgkg: 0

Other notes & definitions

1 Calculation for kg/ha is based on a Bulk Density of 1.3 and a soil depth of 150mm.

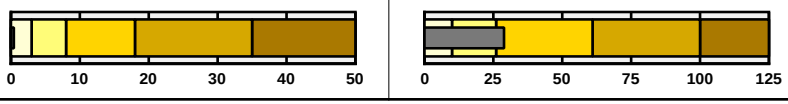
ND denotes Not Determined.

2 Determination of permeability in the laboratory is a guide only. Permeability in the field is influenced by many factors including, but not limited to, the level of compaction and the soil texture and structure.

Category	Description	Probability of response to a nutrient addition
Excessive	Potential phytotoxic response. No nutrient addition required. Drawdown is recommended.	<2
High	Nutrient level is more than adequate and luxury consumption may be occurring.	5-30
Sufficient	The most desirable category. Nutrient additions appropriate for most plants.	30-60
Low	Potential "hidden hunger" or subclinical deficiency.	60-90
Deficient	Growth is likely to be severely depressed and deficiency symptoms present.	>90

PHYSICAL DESCRIPTION

Organic Matter (% by mass):	Permeability [2] (cm/hr, Appendix H, AS4419 Method):	Particle Size Distribution (% by mass, AS4419 Method):	
.42% Very Low	28.87 cm/hr Moderate	< 10mm	100.00
		10 - 20mm	0.00
		> 20mm	0.00



Method References: pH, EC, Sol Cat, NO_3; Bradley et al (1983). **Exch Cat;** Method 15A1 Rayment and Higginson (1992). **PO_4;** Method 9E1 Rayment and Higginson (1992) **Texture, Clay Content/ Potential infiltration rate;** AS4419 - 2003. **Structural Unit;** Chapman & Murphy (1991). **Aggregate Strength;** Sydney University (1982) **NH_4, SO_4, Fe, Mn, Cu, Zn;** Method 83-1 to 83-5 Black (1983). **AS4454 Permeability, PSA;** AS4454 - 2003. **OM;** AS1289 – 1997

SUMMARY OF SOIL CHEMISTRY

pH	EC	Sodicity (ESP)	Ca:Mg	Ca % of eCEC
Slight alkalinity	Very low	Not sodic - normal	Normal	Normal

RECOMMENDATION

Dispersibility in H2O (1:5) : 3
Dispersibility in CaCl2 (1:5) : 1
Wettability : 300mm/min
Toxicity : 84mm

This soil was analysed to determine it's nutrient status for compliance to the Pasminco Cell Reveg Specification. The soil is of a slightly alkaline, non sodic nature and contains a highly magnesic and low potassium cation balance. Of the available nutrients, nitrogen, sulphur, calcium and potassium require amending. Organic matter and dispersibility need amendment to meet spec. requirements.

To amend the calcium, magnesium cation % and dispersibility class, apply **Gypsum at 150g/sqm**. To improve the potassium cation %, apply **Muriate of Potash at 60g/sqm**. To improve the nitrogen level, apply **Urea at 15g/sqm.** Also the application of **Ag Sulphur at 30g/sqm** will contribute to sulphur levels and aid in acidifying the pH to meet spec requirements.

To further improve the organic matter results, apply a composted organic material that is low in phosphorus at 15%w/v.

Consultant: Paul Looby

Authorised Signatory: Murray Fraser

Report Date: 27 Apr 2009

Signature - required for Final Reports

Date: 27/4/2009 **Sample Name:** Pitnacree Sample # 2 - Levee Bank **Sample No.: 2 Batch No.: 9921**

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Landscape Package 4: Complete Soil Assessment

Batch N°: 9921
Sample No: 3

Report Status: ○ Draft ◉ Final

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CLIENT DETAILS:

Ward Civil & Environmental Engineering P/L

PO Box 1067
NORTH RYDE BC NSW 1670

Attn: Emmanuel Mountakis

PROJECT DETAILS:

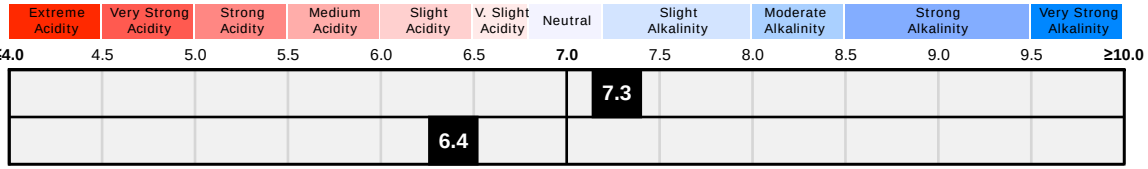
Project Name:
Pasminco Cell Revegetation
Location: Cockle Creek
SESL Quote N°:
Client Job N°: 543
Client Order N°:
Date Received: 16/04/2009

SAMPLE DETAILS:

Sample Name:
Pitnacree Sample # 3 - Dam
Sample N°: 3
Sample Description:
Soil,
Test Type: SS02-L (MS), OM-WB, Disp (4419), Wet (4419), Tox (4419), Perm (4419), Large Particle (4419)

pH and ELECTRICAL CONDUCTIVITY

pH ANALYSIS



ELECTRICAL CONDUCTIVITY (dS/m)

SOLUBLE CATIONS (meq%)

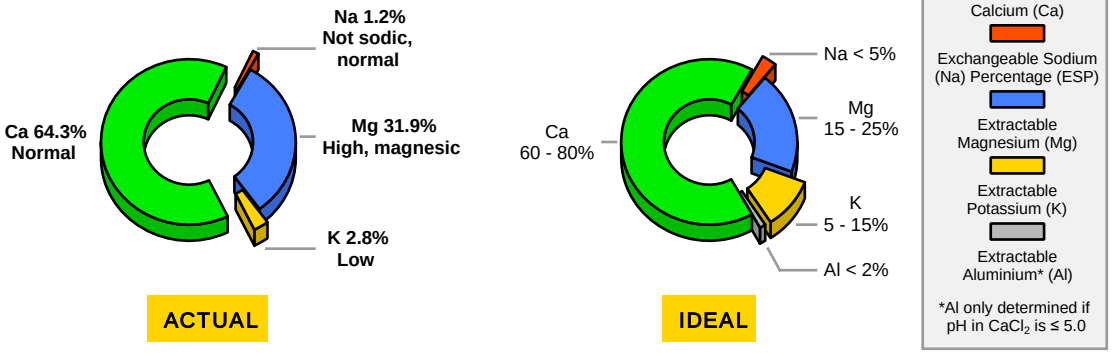
Na **K** **Ca** **Mg**

CHLORIDE (mg/kg)

Only reported when EC (1:5) > 0.25 dS/m.

CATION BALANCE

BASE SATURATION PERCENTAGE (BSP)



CATION RATIOS

Exhangeable Sodium Percentage (ESP)	1.2% - Not sodic, normal				
Ca:Mg	3.3 Normal	**K:Mg**	0.1 Low	**Sodium Absorption Ratio**	ND

EFFECTIVE CATION EXCHANGE CAPACITY (eCEC) (cmol⁺/kg or meq/100g)

CALCULATED LIME REQUIREMENT (CLR)*

Surface application rate:
0 kg/ha (ie. 0 g/m^2), based on treating a 150mm soil depth.

Volume application rate: 0 kg/m^3

CLR = Lime application required to reduce available Aluminium to 0. pH preference and cation ratios must also be considered when determining liming rate and product.

CALCULATED GYPSUM REQUIREMENT (CGR)*

Surface application rate:
1630 kg/ha (ie. 163 g/m^2), based on treating a 150mm soil depth.

Volume application rate: 1.1 kg/m^3

CGR = Gypsum application required to achieve 70% exchangeable Calcium. The CGR is corrected for any Lime addition specified in CLR.

* Calculation for kg/ha and g/m^2 is based on a Bulk Density of 1.3 and a soil depth of 150mm.

Date: 27/4/2009 **Sample Name:** Pitnacree Sample # 3 - Dam **Sample No.: 3 Batch No.: 9921**

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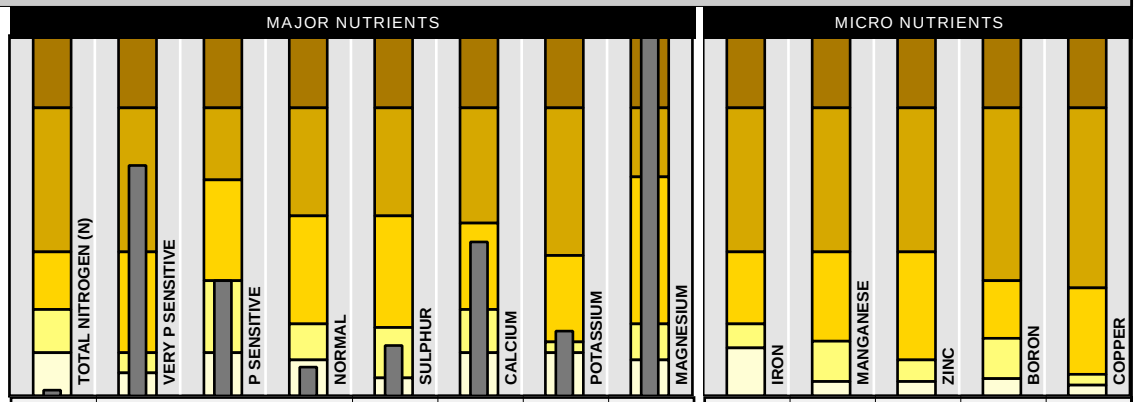
PLANT AVAILABLE NUTRIENT PROFILE



	NH_4+NO_3	Phosphorus as PO_4	Sulphur as SO_4	Ca	K	Mg	Fe	Mn	Zn	B	Cu
mg/kg	2	8	14	2138	180	644	N.D.	N.D.	N.D.	D.N.T.	N.D.
kg/ha [1]	4	16	27	4169	351	1256	N.D.	N.D.	N.D.	D.N.T.	N.D.

NH_4 mgkg: <0.54

NO_3 mgkg: 2

Other notes & definitions

1 Calculation for kg/ha is based on a Bulk Density of 1.3 and a soil depth of 150mm.

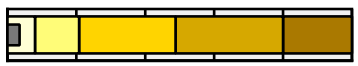
ND denotes Not Determined.

2 Determination of permeability in the laboratory is a guide only. Permeability in the field is influenced by many factors including, but not limited to, the level of compaction and the soil texture and structure.

Category	Description	Probability of response to a nutrient addition
Excessive	Potential phytotoxic response. No nutrient addition required. Drawdown is recommended.	<2
High	Nutrient level is more than adequate and luxury consumption may be occurring.	5-30
Sufficient	The most desirable category. Nutrient additions appropriate for most plants.	30-60
Low	Potential "hidden hunger" or subclinical deficiency.	60-90
Deficient	Growth is likely to be severely depressed and deficiency symptoms present.	>90

PHYSICAL DESCRIPTION

Organic Matter (% by mass):	Permeability [2] (cm/hr, Appendix H, AS4419 Method):	Particle Size Distribution (% by mass, AS4419 Method):	
2.57% Very Low	4.4 cm/hr Very Slow	< 10mm	71.50
		10 - 20mm	13.81
		> 20mm	14.69



Method References: pH, EC, Sol Cat, NO_3; Bradley et al (1983). **Exch Cat;** Method 15A1 Rayment and Higginson (1992). **PO_4;** Method 9E1 Rayment and Higginson (1992)
Texture, Clay Content/ Potential infiltration rate; AS4419 - 2003. **Structural Unit;** Chapman & Murphy (1991). **Aggregate Strength;** Sydney University (1982)
NH_4, SO_4, Fe, Mn, Cu, Zn; Method 83-1 to 83-5 Black (1983). **AS4454 Permeability, PSA;** AS4454 - 2003. **OM;** AS1289 – 1997

SUMMARY OF SOIL CHEMISTRY

pH	EC	Sodicity (ESP)	Ca:Mg	Ca % of eCEC
Slight alkalinity	Very low	Not sodic - normal	Normal	Normal

RECOMMENDATION

Dispersibility in H2O (1:5) : 3
Dispersibility in CaCl2 (1:5) : 1
Wettability : 600mm/min
Toxicity : 93mm

This soil was analysed to determine it's nutrient status for compliance to the Pasminco Cell Reveg Specification. The soil is of a slightly alkaline, non sodic nature and contains a highly magnesic and low potassium cation balance. Of the available nutrients, nitrogen, sulphur, calcium and potassium require amending. Organic matter levels meet Unit 19 but need further amendment to meet Unit 20 requirements. Also dispersibility, permeability and large particles need amendment to meet spec. requirements.

To amend the calcium, magnesium cation % and dispersibility class, apply **Gypsum at 250g/sqm**. To improve the potassium cation %, apply **Muriate of Potash at 50g/sqm**. To improve the nitrogen level, apply **Urea at 15g/sqm.** Also the application of **Ag Sulphur at 30g/sqm** will contribute to sulphur levels and aid in acidifying the pH to meet spec requirements.

To further improve the permeability and organic matter results, apply a composted organic material that is low in phosphorus at 20%w/v.

Consultant: Paul Looby

Authorised Signatory: Murray Fraser

Report Date: 27 Apr 2009

Signature - required for Final Reports

Date: 27/4/2009 **Sample Name:** Pitnacree Sample # 3 - Dam **Sample No.: 3 Batch No.: 9921**

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Landscape Package 4: Complete Soil Assessment

Batch N°: 9921
Sample No: 3

Report Status: ○ Draft ◉ Final

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CLIENT DETAILS:

Ward Civil & Environmental Engineering P/L

PO Box 1067
NORTH RYDE BC NSW 1670

Attn: Emmanuel Mountakis

PROJECT DETAILS:

Project Name:
Pasminco Cell Revegetation
Location: Cockle Creek
SESL Quote N°:
Client Job N°: 543
Client Order N°:
Date Received: 16/04/2009

SAMPLE DETAILS:

Sample Name:
Speers Point Quarry
Sample N°: 4
Sample Description:
Soil,
Test Type: SS02-L (MS), OM-WB, Disp (4419), Wet (4419), Tox (4419), Perm (4419), Large Particle (4419)

pH and ELECTRICAL CONDUCTIVITY

pH ANALYSIS

Extreme Acidity	Very Strong Acidity	Strong Acidity	Medium Acidity	Slight Acidity	V. Slight Acidity	Neutral	Slight Alkalinity	Moderate Alkalinity	Strong Alkalinity	Very Strong Alkalinity
≤4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	≥10.0

pH in H_2O (1:5): 6.4

pH in $CaCl_2$ (1:5): 5.1

ELECTRICAL CONDUCTIVITY (dS/m)

0 1 2 4 6 8 12

EC (1:5): 0.04 Very low

SOLUBLE CATIONS (meq%)

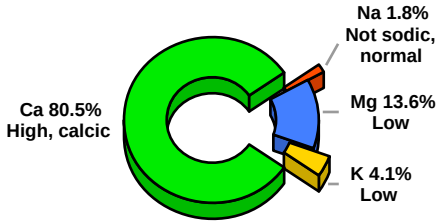
Na **K** **Ca** **Mg**

CHLORIDE (mg/kg)

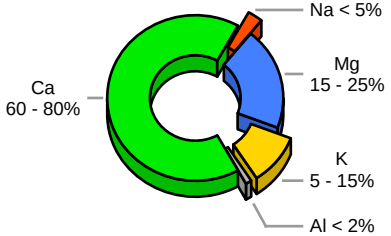
Only reported when EC (1:5) > 0.25 dS/m.

CATION BALANCE

BASE SATURATION PERCENTAGE (BSP)



ACTUAL



IDEAL

Extractable Calcium (Ca)
Exchangeable Sodium (Na) Percentage (ESP)
Extractable Magnesium (Mg)
Extractable Potassium (K)
Extractable Aluminium* (Al)

*Al only determined if pH in $CaCl_2$ is ≤ 5.0

CATION RATIOS

Exchangeable Sodium Percentage (ESP)	1.8% - Not sodic, normal				
Ca:Mg	9.8 High - calcic	**K:Mg**	0.3 Low	**Sodium Absorption Ratio**	ND

EFFECTIVE CATION EXCHANGE CAPACITY (eCEC) (cmol⁺/kg or meq/100g)

0 10 20 50 100

14.8 Moderate

CALCULATED LIME REQUIREMENT (CLR)*

Surface application rate:
0 kg/ha (ie. 0 g/m²), based on treating a 150mm soil depth.

Volume application rate: 0 kg/m³

CLR = Lime application required to reduce available Aluminium to 0. pH preference and cation ratios must also be considered when determining liming rate and product.

CALCULATED GYPSUM REQUIREMENT (CGR)*

Surface application rate:
0 kg/ha (ie. 0 g/m²), based on treating a 150mm soil depth.

Volume application rate: 0 kg/m³

CGR = Gypsum application required to achieve 70% exchangeable Calcium. The CGR is corrected for any Lime addition specified in CLR.

* Calculation for kg/ha and g/m² is based on a Bulk Density of 1.3 and a soil depth of 150mm.

Date: 27/4/2009 Sample Name: Speers Point Quarry Sample No.: 4 Batch No.: 9921

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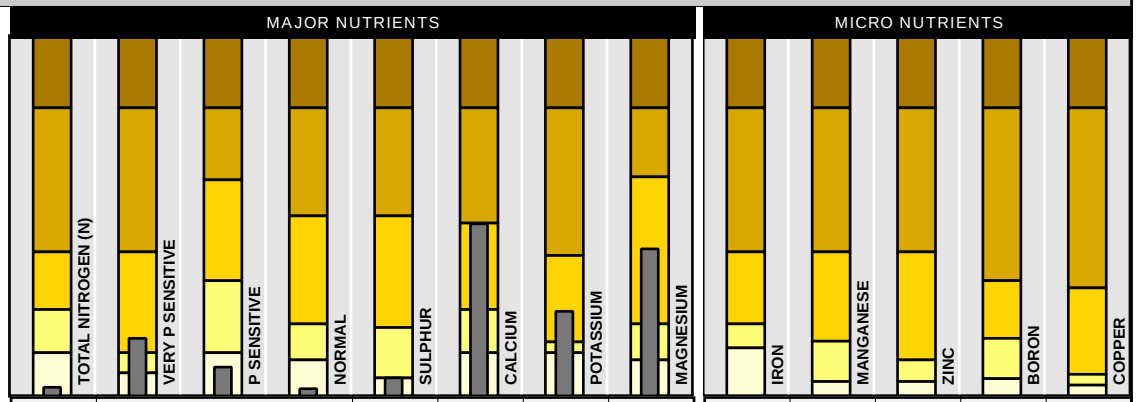
PLANT AVAILABLE NUTRIENT PROFILE



	NH_4+NO_3	Phosphorus as PO_4	Sulphur as SO_4	Ca	K	Mg	Fe	Mn	Zn	B	Cu
mg/kg	3	2	<5	2389	235	245	N.D.	N.D.	N.D.	D.N.T.	N.D.
kg/ha [1]	6	4	10	4659	458	478	N.D.	N.D.	N.D.	D.N.T.	N.D.

NH_4 mgkg: 2.8

NO_3 mgkg: 0

Other notes & definitions

1 Calculation for kg/ha is based on a Bulk Density of 1.3 and a soil depth of 150mm.

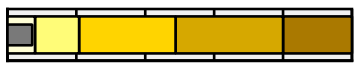
ND denotes Not Determined.

2 Determination of permeability in the laboratory is a guide only. Permeability in the field is influenced by many factors including, but not limited to, the level of compaction and the soil texture and structure.

Category	Description	Probability of response to a nutrient addition
Excessive	Potential phytotoxic response. No nutrient addition required. Drawdown is recommended.	<2
High	Nutrient level is more than adequate and luxury consumption may be occurring.	5-30
Sufficient	The most desirable category. Nutrient additions appropriate for most plants.	30-60
Low	Potential "hidden hunger" or subclinical deficiency.	60-90
Deficient	Growth is likely to be severely depressed and deficiency symptoms present.	>90

PHYSICAL DESCRIPTION

Organic Matter (% by mass):	Permeability [2] (cm/hr, Appendix H, AS4419 Method):	Particle Size Distribution (% by mass, AS4419 Method):	
12.23% Medium	8.99 cm/hr Very Slow	< 10mm	67.06
		10 - 20mm	10.49
		> 20mm	22.45



Method References: pH, EC, Sol Cat, NO_3; Bradley et al (1983). **Exch Cat;** Method 15A1 Rayment and Higginson (1992). **PO_4;** Method 9E1 Rayment and Higginson (1992) **Texture, Clay Content/ Potential infiltration rate;** AS4419 - 2003. **Structural Unit;** Chapman & Murphy (1991). **Aggregate Strength;** Sydney University (1982) **NH_4, SO_4, Fe, Mn, Cu, Zn;** Method 83-1 to 83-5 Black (1983). **AS4454 Permeability, PSA;** AS4454 - 2003. **OM;** AS1289 – 1997

SUMMARY OF SOIL CHEMISTRY

pH	EC	Sodicity (ESP)	Ca:Mg	Ca % of eCEC
Slight acidity	Very low	Not sodic - normal	High - calcic	High - calcic

RECOMMENDATION

Dispersibility in H2O (1:5) : 3
Dispersibility in CaCl2 (1:5) : 1
Wettability : 600mm/min
Toxicity : 101mm

This soil was analysed to determine it's nutrient status for compliance to the Pasminco Cell Reveg Specification. The soil is of a slightly acidic, non sodic nature and contains a highly calcic and low magnesium and potassium cation balance. Of the available nutrients, nitrogen, phosphorus and sulphur require amending. Organic matter levels are acceptable but dispersibility, permeability and large particles need amendment to meet spec. requirements.

To amend the magnesium cation % and sulphur levels, apply **Magnesium Sulphate at 80g/sqm**. To amend the nitrogen, phosphorus and potassium levels, apply Patons **No.27 Red at 40g/sqm** or an equivalent NPK (11.3:5.9:16) fertiliser. To further improve the potassium cation %, apply **Muriate of Potash at 20g/sqm**. To improve the nitrogen level, apply **Urea at 15g/sqm.**

To further improve permeability, apply a composted organic material that is low in phosphorus at 10%w/v. Also to decrease the large particles >20mm, the soil may need to be screened.

Consultant: Paul Looby

Authorised Signatory: Murray Fraser

Report Date: 27 Apr 2009

Signature - required for Final Reports

Date: 27/4/2009 **Sample Name:** Speers Point Quarry **Sample No.:** 4 **Batch No.:** 9921

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