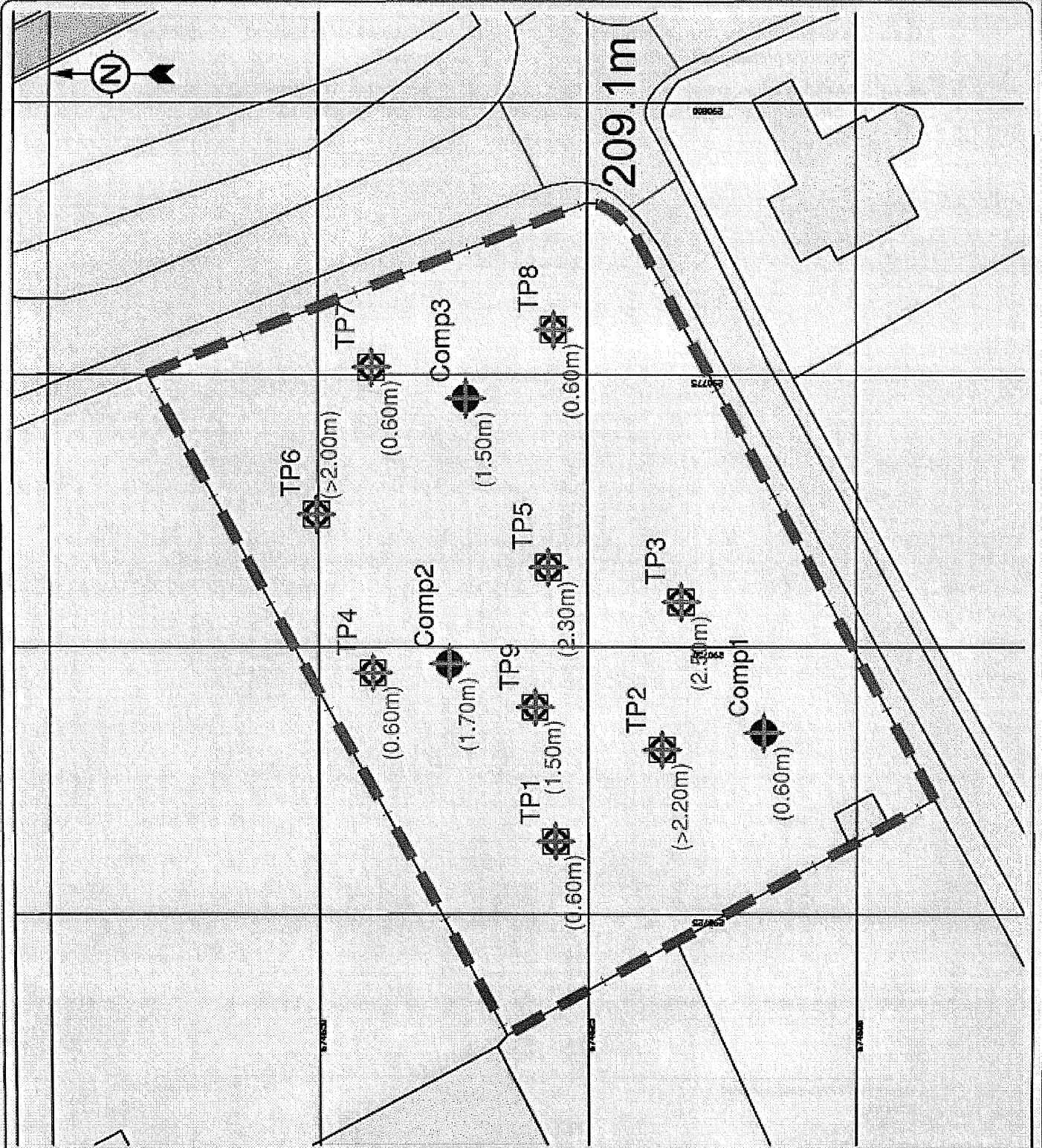


NOTES Site boundary Trial pit excavated by Mason Ryans Partnership (January 2013) Borehole sunk by Aitken Laboratories Limited (January 2013) Conjectured depth to suitable foundation horizon (m) (0.50m)		REV DATE DETAILS	
TP1 to TP9 Comp1 to Comp3 (0.50m)		PRO-CONSTRUCTION LIMITED 4 MOUNTBLATTEN PLACE ROSYTH KY11 2HL	
PROJECT TITLE GREYRIGGS CALIFORNIA, FALKIRK		DRAWING TITLE CONJECTURED DEPTH TO SUITABLE FOUNDATION HORIZON	
DRAWN BY PH	CHECKED BY G2012/356	DATE 09.05.13	SCALE 1:500 @ A4
PROJECT NO. G2012/356	DRAWING NO. G2012/356/SU/F/11	REVISION	

masonnevans
 geo-environmental consultants

The Plaza, 95 Morrison Street, Glasgow, G5 8BE
 T: 0141 420 2023 F: 0141 420 2057
 e: info@masonnevans.co.uk W: www.masonnevans.co.uk

Geotechnical & Environmental Engineering Ltd. (incorporated)



12.0 MINING AND MINERAL EXTRACTION

12.1 General

12.1.1 While old mineworkings are susceptible to collapse, occasionally leading to surface subsidence, assessments of the potential impact of old mines requires consideration of various aspects of the geology and mining conditions.

12.1.2 The geological assessments indicated that the shallowest recorded mineral seam below the site is the Lower Drumgray Coal, which is indicated to be 1.5m in thickness and lie at depths in excess of approximately 20m below the area. The rotary borehole drilled at the site recorded rockhead 19.8m to 21.5m. All boreholes recorded solid strata with the exception of borehole R3 which recorded a void from 21m to 23m. This is interpreted to be workings in the Lower Drumgray Coal.

12.2 Mining History and Conditions

12.2.1 The site was indicated to be within an area of known mineworkings. The Lower Drumgray Coal is recorded to have been worked below the site, possibly by longwall workings. The void recorded within borehole R3 is interpreted to be representative of a roadway within the former mine workings of the coal seam. It is considered possible that the remaining boreholes recorded collapsed conditions and hence other intact open roadways may exist.

12.2.2 The available maps did not record any shafts or adits within the site or within close vicinity of the site. However as within all areas of previous mining activity the possible presence of unrecorded mine entries cannot be discounted.

12.3 General Principles of Surface Instability

12.3.1 Deterioration within old mineworkings can lead to collapse a considerable time after abandonment. The mechanisms of failure are varied and complex but generally involve either a yield in the roof of the mine between supports, or collapse as a direct result of failure of the supports.

12.3.2 Except in instances where the mineworkings are very shallow for example, less than 10 m deep, the stability is comparatively unaffected by enhanced loadings from buildings or by vibrations from heavy traffic. Progressive deterioration within the workings can, however, advance to a stage where instability is reached and collapses occur. In most cases, however, it is impossible to predict with any degree of accuracy if, and when, such movements will take place.

12.3.3 Accordingly, it is generally accepted that old abandoned mineworkings are susceptible to collapse. Researches based on observations and past experience do, however, permit some assessment of the likelihood of any collapses within the mines being experienced at the surface as subsidence. It is also possible to make reasonable assessment of the magnitude of movements which may occur under assumed failure conditions.

12.3.4 The subsidence assessments consider various elements of the geological and mining configuration. These include the nature and thickness of the rock and soil overburden, the extracted height of the workings and the typical mine configuration.

12.3.5 The subsidence assessments consider various elements of the geological and mining configuration. These include the nature and thickness of the rock and soil overburden, the extracted height of the workings and the typical mine configuration.

12.3.6 In our assessment we have sought to achieve a rock cover thickness of 8times the seam extraction height for longwall mining extraction. This is consistent with a number of studies in the field of mining stability assessment.

Surface Instability Due To Mining

- 12.3.7 Using the criteria stated above the minimum rock cover required above the shallowest worked seam the Upper Coal would be 13 m of rock (1.5 m x 8 m). In such circumstances the available information indicates that there is insufficient rock cover to preclude the site from surface instability due to mining. In such circumstances we would recommend the workings are stabilised by drilling and pressure grouting.

12.4 **Mine Entries**

- 12.4.1 Our researches have indicated no records of abandoned mineshafts or adits within the site boundaries, however, the possibility of unrecorded mine entries cannot be fully discounted.

12.5 **Quarrying**

- 12.5.1 Our researches have not identified any evidence of quarrying within the site.

12.6 **Potential for Future Mineral Extraction**

- 12.6.1 While we feel that it is highly unlikely that underground or surface mineral extraction will occur beneath or within the site in the future, we have not carried out detailed assessments of this matter during the course of the study. However, mineral reserves exist in the locality which could be worked at some time in the future, subject to feasibility licenses and planning consent and therefore should be examined by the client's legal advisors.

13.0 CONCLUSIONS AND RECOMMENDATIONS

13.1 GENERAL

- 13.1.1 Mason Evans Partnership Limited has performed an intrusive investigation to identify ground risks that have potential to impact on future development at the site.
- 13.1.2 The ground conditions encountered during the investigation were generally consistent with the anticipated ground conditions as shown on published geological maps

13.2 CHEMICAL CONTAMINATION AND GAS EMISSIONS

- 13.2.1 Based on chemical analysis and assessment to determine risks to the proposed development it is concluded no remedial measures are required with respect to chemical contamination.
- 13.2.2 Risks associated with ground gas are considered to be present and gas protection measures are recommended.

13.3 GEOTECHNICAL CONCLUSIONS AND RECOMMENDATIONS

- 13.3.1 Based on our interpretation of the ground conditions identified, it is recommended the foundations are placed at depths of approximately 1m to 2.5m below existing ground level where a bearing capacity of 75kN/m² to 100kN/m² could be achieved.

13.4 MINING

- 13.4.1 It is concluded the site is subject to potential surface instability due to shallow abandoned mineworkings in the Lower Drumgray Coal. Stabilisation of the mineworkings is recommended by means of drilling and pressure grouting.

13.5 CONSULTATIONS WITH PUBLIC AUTHORITIES

- 13.5.1 It should be noted that various local authority departments may become involved in the review of the site conditions, including the issues of contaminated land. While measures proposed are consistent with conventional practice we would advise that before design works are advanced to any considerable stage appropriate approvals are received from the relevant Council departments. We would be pleased to liaise with the Council's representatives in this regard.

We trust that this will meet with your current requirements. However, should you require any further information, please do not hesitate to contact us.



Neil M Thomson BSc FGS
Director

mason evans 
environmental consultants

APPENDIX 1

SITE WALKOVER SURVEY

SITE WALK OVER SURVEY RECORD

Project: Greyriggs Reservoir Falkirk

Project Engineer: N Thomson

Project Title: Greyriggs Reservoir Falkirk	Site Area: 0.32 Ha approximately
Site Location: To the south of California Falkirk district	
Date Of Inspection: 21 November 2012	Weather : Dry

Site Condition

Current Site Usage	Vacant site
Properties in Proximity	Residential properties are present to the west, east and south.
Site Accessibility	From Boxton Road to the south
Watercourses in proximity	None

Site Description

Profile	The site is essentially flat lying
Surface covering	Opportunistic Vegetation
Condition of Structures	N/A

Obvious Contamination

Noxious smells	None noted
Tipping	None noted
Discoloured water	None noted
Surface staining	None noted

Tanks and Drums

Above ground tanks	None noted
Subsurface tanks	None noted
Chemical Drums	None noted

Public Utilities

Overhead cables	None
Underground services	Drainage was indicated
Manholes	None
Transformers	None noted on site

Structures

Buried Foundations	Possible
Underground voids	None noted, but possible

Slope Stability

Any obvious instability	None noted.
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Any other general comments

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APPENDIX 2**EXTERNAL REPORTS**

RBMP Water body information sheet for water body 150234 in Forth

General details

Water body name: Stirling and Falkirk bedrock and localised sand and gravel aquifers
 Water body identifier code: 150234
 Area km²: 555.46
 Water body category: Groundwater
 Baseline: Y
 River basin district: Scotland
 Area advisory group: Forth
 Associated protected areas: Stirling and Falkirk bedrock and localised sand and gravel aquifers
 Associated surface waters: Bainsford Burn
 Bannock Burn (Sauchie Burn confluence to Steuarthall Farm)
 Boghead Burn/Bog Burn/Couston Water
 Bogstank Burn
 Bonny Water/Red Burn
 Breich Water/Daramead Linn
 Brunton Burn
 Carmuir's Burn
 Claghrie Burn
 Daramead Linn
 Drumtassie Burn
 Foulshiels Burn
 Foulshiels Burn/Bickerton Burn
 Glencryan Burn
 Grange Burn/Westquarter Burn
 Holehouse Burn
 How Burn
 Kitchen Linn
 Logie Water/Barbauchlaw Burn
 Manuel Burn
 Milnquarter Burn
 Polmaise Burn
 Pow Burn / Tor Burn from source to confluence with Sauchinford Burn
 Pow Burn from Bridge-end to Forth Estuary
 River Almond (Source to Foulshiels Burn confluence)
 River Avon (Jawhills to Logie Water confluence)
 River Avon (Logie Water confluence to Estuary)
 River Avon (Source to Jawhills)
 River Carron (Avon Burn to Bonny Water Confluences)
 River Carron (Bonny Water confluence to Carron Estuary)
 Rowantree Burn
 Sauchinford Burn (Plean sewage works to Pow Burn)

RBMP Water body information sheet for water body 150234 in Forth

Sauchenford Burn (Source to Plean sewage works)
 Sauchie/Canglour Burn
 Stream from Whitrigg Colliery Bing
 Unnamed Tributary of Bog Burn
 Unnamed tributary of R. Almond (benhar)
 Unnamed tributary of the Red Burn (confluence at B8054)
 White Burn
 Woodmuir Burn

Responsible body: SEPA
 Falkirk & W Lothian, Stirling, South Lanarkshire, North Lanarkshire

National Grid Reference NS 88657 75477

Latitude: 55.95936

Longitude: -3.78502

Current status of this water body

We have classified this water body as having an overall status of Poor with High confidence in 2008.

The quality of the groundwater has been classified as Poor with High confidence and the quantity of groundwater has been classified as Good with High confidence in 2008

There is no trend for pollutants for this water body.

This overall classification of status is made up of many different tiers of classification data. A complete set of classification data for 2008 is shown at the end of this document.

Targets for the future status of this water body

We have set environmental objectives for this water body over future river basin planning cycles in order that sustainable improvements to its status can be made over time, or alternatively that no deterioration in status occurs, unless caused by a new activity providing significant specified benefits to society or the wider environment.

For this water body we have set the overall environmental objectives for the first, second and third River Basin Management Planning (RBMP) cycles as:

Year	2008	2015	2021	2027
Overall Status	Poor			
Chemistry Status	Poor	Poor	Poor	Poor
Quantitative Status	Good	Good	Good	Good

We have established an ongoing programme of monitoring in order to identify pressures on our water bodies. The pressures listed below contribute to this water body's failure to meet good ecological status. River basin planning allows us to plan improvements for particular parameters over time. We have collaborated with others to identify measures which will act to protect or