ACID MINE DRAINAGE GENERATION POTENTIAL OF WASTE ROCKS USING WEATHERING CELL TEST IN GOLD MINE, THAILAND

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การประเมินศักยภาพการเกิดน้ำเหมืองเป็นกรดโดยวิธี WEATHERING CELL ของเหมืองทองคำประเทศไทย

นางสาวเยาวลักษณ์ จรัสเอี่ยม

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เยาวลักษณ์ จรัสเอี่ยม : การประเมินศักยภาพการเกิดน้ำเหมืองเป็นกรดโดยวิธี WEATHERING CELL ของเหมืองทองคำ ประเทศไทย. (ACID MINE DRAINAGE GENERATION POTENTIAL OF WASTE ROCKS USING WEATHERING CELL TEST IN GOLD MINE, THAILAND) อ. ที่ปรึกษาวิทยานิพนธ์หลัก : ผศ. ดร. ศรีเลิศ โชติพันธรัตน์, อ.ที่ปรึกษาวิทยานิพนธ์ร่วม : รศ.ดร.จักรพันธ์ สุทธิรัตน์, 211 หน้า.

ในกิจการเหมืองแร่ผลิตหินปริมาณมากมายและทิ้งให้สัมผัสกับน้ำและอากาศ ซึ่งอาจก่อให้เกิดน้ำเหมืองเป็นกรดได้ งานวิจัยนี้มีเป้าหมายเพื่อประเมินศักยภาพการเกิดน้ำเหมืองเป็นกรดและประเมินการปนเปื้อนของโลหะพิษและธาตุร่องรอยในหินตัวอย่างจากเหมืองทองคำ ประเทศไทย โดยตัวอย่างทั้งสิ้น 25 ตัวอย่าง จากกองหินทิ้งโซนออกไซด์ จำนวน 9 ตัวอย่าง, โซนทรานซิสชั่น จำนวน 11 ตัวอย่าง และโซนซัลไฟล์ จำนวน 5 ตัวอย่าง ถูกประเมินศักยภาพการเกิดน้ำเหมืองเป็นกรดด้วยวิธี WEATHERING CELL วิธีนี้ประกอบด้วยรอบละ 7 วัน จำนวนทั้งสิ้น 21 รอบ แต่ละรอบเก็บน้ำตัวอย่างแล้ววัดค่าพีเอช คุณสมบัติการนำไฟฟ้า ค่าความต่างศักย์ไฟฟ้ารีดอกซ์ และวิเคราะห์ปริมาณซัลเฟตรวมถึงโลหะหลักและธาตุร่องรอย สารหนู เหล็ก ตะกั่ว โคบอลต์ แคลเซียม แมกนีเซียม แมงกานีส ทองแดงและสังกะสี ผลการศึกษาพบว่าหินตัวอย่างมีศักยภาพการเกิดน้ำเหมืองเป็นกรด โดยเฉพาะอย่างยิ่ง ในกองหินทิ้งโซนทรานซิสชั่นและกองหินทิ้งโซนซัลไฟล์ โดยค่าพีเอชของน้ำจากตัวอย่างในกองหินทิ้งโซนออกไซด์ ค่อนข้างเป็นกลางถึงด่าง (ค่าพีเอชประมาณ 6 ถึง 9) ส่วนน้ำตัวอย่างจากกองหินทิ้งโซนทรานซิสชั่นและโซนซัลไฟล์ค่อนข้างเป็นกรด (ค่าพีเอชประมาณ 3 ถึง 7) ดังนั้นตัวอย่างจากกองหินทิ้งโซนออกไซด์และทรานสซิสชั่นมีศักยภาพการเกิดกรดและปริมาณซัลเฟตมากกว่าในกองหินทิ้งโซนออกไซด์ นอกจากนี้ในบางตัวอย่างหินสามารถปลดปล่อยโลหะหนักในปริมาณมาก โดยเฉพาะปริมาณสารหนูซึ่งสูงถึงพบในกองหินทิ้งโซนออกไซด์ โซนทรานซิสชั่นและโซนซัลไฟด์ (ปริมาณ 0.748 0.725 0.851 มิลลิกรัมต่อลิตร ตามลำดับ) ซึ่งหากปนเปื้อนลงสู่แหล่งน้ำผิวดินหรือน้ำบาดาล จะส่งผลกระทบร้ายแรงต่อสิ่งแวดล้อม การประเมินการศักยภาพการเกิดกรดในระยะยาวโดยใช้โค้งออกซิเดชั่น นิวทรีไลท์เชชั่น พบว่าหลังจาก 144 วันของการทดลอง ตัวอย่างหินทิ้งมีศักยภาพในการเกิดกรดในระยะยาว

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ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์ร่วม .....

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YAOWALUCK CHARUSEIAM: ACID MINE DRAINAGE GENERATION POTENTIAL OF WASTE ROCKS USING WEATHERING CELL TEST IN GOLD MINE, THAILAND. ADVISOR : ASST. PROF. SRILERT CHOTPANTARAT, Ph.D., CO-ADVISOR : ASSOC. PROF. CHAKKAPHAN SUTTHIRAT, Ph.D., 211 pp.

In gold mine, tons of waste rocks produced and left under atmospheric condition may consequently generate acid mine drainage (AMD). The aims of this study was to predict the AMD generation potential and estimate the concentrations of potentially toxic metals elements of three dump sites of waste rocks from a gold mine in Thailand. Twenty-Five waste rock samples from three dump sites, 9, 11, and 5 samples from oxide dump site, transition dump site and sulfide dump site, respectively, were determined the AMD generation potential by used the weathering cell test. The kinetic test composes with seven-day cycle (experiment run ~21 cycles), the effluent from each cycle were measured pH, conductivity, redox potential, sulfate and major and trace metals (i.e., As, Ca, Co, Cu, Fe, Mg, Mn, Pb, Zn).The results showed that some samples generate significant amount of AMD, especially samples collected from transition and sulfide dump sites. The pH of effluent water in oxide dump site had neutral to slightly alkalinity (pH ~6-9) while those in transition and sulfide dump sites had neutral to acid pH (pH ~ 3-7). The samples in transition and sulfide dump sites significantly generate higher acidity and sulfate than those in oxide dump site. Futhermore, the result revealed that some waste rock samples released relativly high concentration of heavy metal. Especially, As which was toxic heavy metal found in oxide dump site, transition dump site and sulfide dump site (maximum 0.748, 0.725 ,0.851 mg/L, respectively). Theses toxic elements may contaminate in surface or ground water and affect to living health. The long term acid generation interpreted by using oxidation-neutralization curve, indicating that after 144 days of leaching waste rock samples from all dump sites continue to generate acid for long period.

Field of Study : Environmental Management Student's Signature .....
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Abbreviations

AMD: Acid mine drainage

APHA: American Public Health Association

ASTM: American Society For Testing And Material

DMR: Department of Mineral Resources

EC: Conductivity

Eh: Redox potential

PAF: Potential acid forming

NAF: Non-acid forming

UC: Uncertain classification

U.S. EPA: The United States Environmental Protection Agency

CHAPTER I

INTRODUCTION

1.1 Rationale

Mining activity is one of the land exploitation, which has significant effects on surrounding environment and human health nearby the site and may in turn be as the major issue in environmental concern for long periods (Salomon, 1995).

Gold mineral oftenly associated with sulfide ores (Gray, 1998), commonly occurs as arsenopyrite (FeAsS), charcopyrite ($CuFeS_2$) and pyrite (FeS_2), the invisible gold deposit precipitate in this kind of mineral. The sulfide mineral, especially pyrite, can naturally react with oxygen and water under atmospheric condition and generate Acid Mine Drainage (AMD) which deteriorate the environment. However, the rate of acid generation is very slowly. Mining activity, especially open pit mine, generates large amount of mine waste such as waste rocks and tailings (Benzaazoua *et al*., 2008), containing sulfide minerals (Salomons, 1995), are exposed under atmospheric condition, which significantly increase AMD generation rate.

The acid drainage problem produces sulfuric acid which is low pH. As the pH is acidic, the heavy metals, i.e. Chromium (Cr), Copper (Cu), Zinc (Zn), Cadmium (Cd) and Lead (Pb), will be increased their solubility (Benzaazoua *et al*., 2008). This is the pathway which metal enter to surroundings by mining activity (Salomons, 1995). In case of leaching discharge to water surface and/or ground water, it consequently can cause hazard environmental problem.

The prediction of AMD generation potential is important for preventing and controlling acid mine drainage and for choosing the appropriate method for rehabilitation strategy after mine closure to minimize the adverse effect of this problem (Bouzahzah *et al.,* 2004). The AMD generation potential in each site is difficult to predict because it is highly variable depending on mineralogy and other factors (Akcil and Koldas, 2006). Furthermore, in mine waste found a number of mineralogical reactions (Cruz *et al.*, 2001). The prediction techniques have been used and developed to assess the AMD generation potential and AMD generation rate

(Changul *et al.,* 2010; Chotpantrat, 2011; Hakkou *et al.,* 2008a). From the previous studies, there have 2 types of prediction methods as follows: (1) the static test (2) the kinetic test (Kargbo and He, 2004, US. EPA, 1994). The static test has been widely used and well-known because this method use a short of time to measures and is cheaper than the kinetic test (Hakkou *et al.,* 2008a; Bouzahzah *et al.,* 2004; Chotpantarat, 2011); nevertheless, these method cannot define uncertainty group and can not estimate the sulfide oxidation (Sepsford and Willium, 2005). Hence, the kinetic tests have been conducted to define AMD generation potential, especially for uncertainty group and predict rate of sulfide oxidation. The results derived from the kinetic tests can provide the curves, plotting between sulfate and summation of carbonate species, so-called "oxidation-neutralization curve". The curve can capable of assessing the long term AMD generation potential (Benzaazoua *et al.,* 2004; Buazahzah *et al.,* 2010; Changul *et al.,* 2010; Hakkou *et al.,* 2008a; Sepsford and Willium, 2005).

There are several types of kinetic test used to evaluate the AMD generation such as humidity cell test (Sapsford *et al.,* 2009; Ardau *et al.,* 2007), laboratory-based columns and field-based test pad (Sepsford and Willium, 2005); however, among these tests the humidity cell test has been recommended. The humidity cell test is more aggressive because this test can use lesser material and shoter period as compared with other kinetic test methods (Hakkou *et al.,* 2008a; Benzaazoua *et al.,* 2004; Sepsford and Willium, 2005; Sapsford *et al.,* 2008).

The study of Benzaazoua *et al.*(2004) evaluated the AMD generation potential in Joutal mine site using kinetic tests, column and humidity cell tests, and compared their oxidation-neutralization curve.s The comparison showed that even though the cumulative elements recovered from the solution of humidity cell and column test were different, but both tests had a similar ratio of neutralizing product to oxidizing product. For that reason, the humidity cell test has been suggested for AMD prediction because the duration of humidity cell tests is shorter than that of the column test (210 days and 405–445 days, respectively). Moreover, the lower amount of material (750–1,000 grams) used for humidity cell test, while 8,300 grams of material have been used for column test.

Hakkou *et al.* (2008a) studied AMD generation potential using the humidity cell tests and weathering cell test. Even through the humidity cell test is the most

popular laboratory-based kinetic test, environmentalists try to develop the weathering cell test instead of the humidity cell test because it is easier to set up the experiment than another, and only 70 grams of mine waste material used, whereas 750-1,000 grams of mine waste material used in the humidity cell tests. In addition, time for evaluating the acid mine generation of the humidity cell tests are longer than weathering cell test (53 and 20 weeks, respectively). According to such study, based on cumulative curves and depletion data, the result from weathering cells are relatively close to those derived from the humidity cell test. Therefore, the weathering cells test would be suggested instead of humidity cells because this method is faster and uses a smaller amount of material.

According to previous studies (DMR, 2008; Changul *et al.,* 2010) in relation to gold mining sites in Thailand, it found that such mining could potentially generate acid mine drainage. The study of Department of Mineral Resources (DMR, 2008) analyzed concentrations of potentially toxic metals in soil, stream sediment, surface and ground water. This work reported that the concentration of Arsenic (As) > 0.01 mg/L, Manganese (Mn) > 0.3 mg/L, and found trace elements, Copper (Cu) and Lead (Pb), Cyanide (CN^-), which normally were not found in water, especially in surface water and water in groundwater wells located in mine areas. Thereby this mine site should have been evaluated the acid generation potential and acid generation rate to provide the appropriate plan to reduce the hazardous effect to environment and livings nearby.

1.2 Objectives

The aims of this thesis were focused on the AMD generation potential which may generated from a gold mine, in Thailand and the heavy metals may be released to environment due to the acid mine water problem. There were two objectives of this thesis as following:

1) To determine potential of acid mine drainage generation from waste rocks and rate of acid mine generation from waste rocks.

2) To investigate the concentrations of heavy metals in leachate solution from weathering cell test.

1.3 Scope of Study

Twenty five waste rock samples were collected from waste dump sites at a gold mine in Thailand, which have been deposited in three dump sites (i.e. oxidation dump, sulfide dump and transition dump). All samples were analyzed the geochemical behavior such a pH, conductivity (EC) and redox potential (Eh), during the weathering cell tests. In addition, the heavy metal concentrations i.e. arsenic (As), cobalt (Co), copper (Cu), manganese (Mn), lead (Pb), iron (Fe) and zinc (Zn), also calcium (Ca) and magnesium (Mg) were also measured by Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES). For long term assessment of AMD generation potential can be predicted using oxidation-neutralization curve by plotting between cumulative SO_4^{2-} concentration and sum of Ca, Mg, Mn, which are main oxidation product and main carbonate dissolution product. The linear curve mean the ratio of neutralization and oxidation product stay the same, indicating that depletion and precipitation may not cause AMD in the long term.

1.4 Expected Research Outcomes

1) The heavy metal concentrations i.e., arsenic (As), cobalt (Co), copper (Cu), manganese (Mn), lead (Pb), iron (Fe) and zinc (Zn), also calcium (Ca) and magnesium (Mg) in the leachate obtained from weathering cell test.

2) AMD generation potential and the rate of AMD generation of each sample collected from different zones.

CHAPTER II

LITERATURE REVIEWS

2.1 Acid mine drainage problems

The mining industries, i.e. nickel, copper, and gold mines, have high economic value in many countries. When extraction of ore successfully complete, the rest which were crushed and grinded to lower grain size, typically fine sand to silt grain size, are transported from milling process into dump site as a slurry (Dold, 2010). The tailing impoundment usually locates nearby mine site; therefore, environmental concern has become a considerable factor for the mining operation. The mining industries generate large amount of waste, solid and liquid wastes (Benzaazoua *et al.,* 2008). The solid wastes generally divided into two groups, mine tailings and waste rocks. As mentioned, the final product of processing is tailings, generally ranged from silt to sand size while particle size of waste rocks is generally large (ranging from fine-grained sand to gravel-sized materials to large blocks of several meters in diameter), are valueless material which removed from mine to access the ore deposit, including low grade ores that cannot be gained value minerals commercially (Sracek *et al.,* 2004). However, both mine wastes may potentially generate acid drainage problem.

Acid Mine Drainage (AMD) is a major problem in mining and mineral industries and usually exists in iron sulfide-aggregated rock (Akcil and Koldas, 2006). The AMD is formed by the oxidation of sulfide minerals which react with oxygen and water under atmospheric condition. The reactions of AMD generation compose of several oxidations of sulfide mineral reactions.

The first reaction (Eq. 2.1) is oxidation of sulfide mineral into dissolved ferrous iron (Fe^{2+}), sulfate (SO_4^{2-}) and hydrogen ion (H^+).

$$2FeS_{2(s)} + 2H_2O + 7O_2 \rightarrow 2Fe^{2+} + 4SO_4^{2-} + 4H^+ \qquad (2.1)$$

The dissolved ferrous iron (Fe^{2+}), sulfate (SO_4^{2-}) and hydrogen ion (H^+) induce a decrease in the pH. In properly condition, such reaction depends on O_2 concentration, pH and the activity of bacteria such as *Thiobacillus thioparus*. Second reaction, the

ferrous iron will oxidize to ferric iron (Fe^{3+}) (Eq.2.2).

$$4Fe^{2+} + O_2 + 4H^+ \longrightarrow 4Fe^{3+} + 2H_20 \quad (2.2)$$

The ferric iron will precipitate as $Fe(OH)_{3(s)}$ while pH value between 2.3-3.5 (Eq. 2.3); however, not all of ferric iron can precipitate in this solution.

$$Fe^{3+} + 3H_2O \longrightarrow Fe(OH)_{3(s)} + 3H^+ \quad (2.3)$$

The remain ferric iron which does not precipitate through the above equation are use to oxidize the additional pyrite (Eq. 2.4).

$$2FeS_2 + 14Fe^{3+} + 8H_2O \longrightarrow 15Fe^{2+} + 2SO_4^{2-} + 16H^+ \quad (2.4)$$

The Eq. 2.5 is combination of the Eq. 1-3 based on basic reaction which ferric iron precipitation as $Fe(OH)_{3(s)}$

$$4FeS_2 + 15O_2 + 14H_2O \longrightarrow 4Fe(OH)_{3(s)} + 8SO_4^{2-} + 32\ H^+ \quad (2.5)$$

On the other hand, the combination of the Eq. 1–3 in Eq. (6) is in case of the stable ferric iron is used to oxidize pyrite.

$$8\ FeS_2 + 15O_2 + 26Fe^{3+} + 34H_2O \longrightarrow 60\ Fe^{2+} + 16SO_4^{2-} + 68H^+ \quad (2.6)$$

All the above equations assume that pyrite is the oxidized mineral and oxygen is oxidant. However, in case of the oxidize minerals are other sulfide minerals such as pyrrhotite ($Fe_{1-x}S$), which have various ratios of metal sulfide and mineral, the reaction pathway will be different.

This evidence may lead to generate acid effluents, rich in soluble heavy metals, sulfate, iron and toxic substances, to environment for a decade to millennial that consequently impact to surrounding environment and human health. Normally, the AMD processing can occur naturally because bacteria can breakdown the sulfide mineral and accelerate AMD production. However, mining activities can enhance AMD generation by increasing the quantity of exposed sulfide in mine wastes, dominantly pyrite (FeS_2) and pyrrhotite ($Fe_{1-x}S$) (Akcil and Koldas, 2006; Benzaazoua *et al.,* 2004).

The AMD has a negatively considerable impact on environment, biodiversity and harmful animal and human health. Consequently, AMD can release toxic substances, i.e., cyanide, copper, zinc and lead, in large amounts of quantities, which potentially contaminate in nearby water resources (Cruz *et al.,* 2001; Sepsford and Willium, 2005; Benzaazoua *et al.,* 2004; Kleiv and Thornhill, 2008; Sapsford *et al.,*2009).

Therefore the prediction of AMD generation potential is importance for prevention and control of acid drainage problem. Furthermore, in some mine sites where AMD has not yet formation, the AMD prediction will help to determine which prevention way can be proposed (Akcil and Koldas, 2006). On the other hand in mining sites where AMD has formed, the AMD prediction is useful for control the problem by identifing the acid mine drainage generation rate that will reduce or remediated the AMD impact on environment (Akcil and Koldas, 2006; Chotpantrat, 2011; Kleiv and Thornhill, 2008; Sapsford *et al.,* 2008). However, the potential and rate for mining industries to generate acid drainage problems depend on many factors and site specific (Stromberg and Benwart, 1994). The main contributing factors affecting to AMD generation potential are water and oxygen; however, the mineralogy and the other factors should be considered accounting for the AMD formation. The assessing of AMD generation potential is ambitious and costly because each mining site is the unique characteristic; hence, the AMD generation potential will vary from site-to-site (Akcil and Koldas, 2006).

2.2 Parameters of characterization AMD

Even though every mine is unique in term of AMD generation potential and rate, the characteristics are similar, such as low pH and high concentration of sulfate (SO_4^{2-}), iron (Fe^{2+}), and dissolved metals and other toxic elements (Hakkou *et al*., 2009; Akcil and Koldas, 2006).

Pyrite (FeS_2) embedded in mine wastes were oxidized to SO_4^{2-}, Fe^{2+} and H^+ that resulting AMD (Jonsson *et al.*, 2006). The pH in AMD usually ranges of pH 2 or less; therefore, the heavy metals and other toxic elements may be dissolved in effluent. Hakkou *et al.* (2008b) studied the AMD geochemical behavior at the Kettara mine site, Morocco and reported levels of pH of samples decreased to very acidic values (pH <

3), and release harmful concentrations of metals and sulfide. On the other hand, Benzaazoua *et al.* (2004) studied in Joutel mine site, Canada and reported that the pH from samples were around 7, as a non acid generation, trace element such as Silicon (Si), Aluminum (Al), and Iron (Fe) were low concentration.

Furthermore, many parameters measured for the characterization of mine drainage, such as pH, redox potential (Eh), conductivity (EC), acidity, which are crucial factors governing precipitation of mineral. Some specific physic-chemical properties of waste rocks were described below.

2.2.1 Acidity

Acidity of mine drainage are commonly measured or calculated to indicate the AMD generation potential. Acidity is a result of sulfide oxidation, which can produce sulfate; therefore, the acidity can indicate the sulfate production. In mine processing, the sources of acidity are hydrogen ion (H^+), metal acidity and carbon dioxide (CO_2). However, due to the natural of CO_2, when it reaches the surface and in atmospheric condition, the CO_2 degasses rapidly; therefore, AMD prediction for mine drainage treatment can neglect the CO_2 concentration (Kirby *et al.,* 2005a,b). The standard method titration resulting the underestimate; thereby, the result lead to ineffective system in AMD treatment. ASTM D1067-11 Standard Test Methods For Acidity Or Alkalinity Of Water (ASTM, 2011) is conducted to apply with mine drainage. This titration test method so-called Hot Acidity Titration, drives off CO_2 by boiling the solution. The ferrous iron oxidation and hydrolysis in mine waste also generate acidity; hence, peroxide (H_2O_2) will add to the solution and boil to accelerate the chemical reaction. During titration ferric ion precipitated as ferric hydroxide (in Eq. 2.7-2.9, ASTM, 2011, Kirby *et al.,* 2005).

$$2Fe^{2+} + O_2 + 1/2OH^- + H_2O \longrightarrow 2Fe(OH)_3 \qquad (2.7)$$

$$2Fe^{2+} + H_2O_2 + 2H^+ \longrightarrow 2Fe^{3+} + 2H_2O \qquad (2.8)$$

$$Fe^{3+} + 3OH^- \longrightarrow Fe(OH)_3 \qquad (2.9)$$

Acidity obtained from the titration might be positive or negative value. The negative value should be equal to the alkalinity (APHA, 1998); however, the negative value of acidity commonly reports as zero (Kirby *et al.,* 2005a,b). The measurement of acidity is useful for mine drainage treatment because in case of the acidity value can effect environment, alkalinity materiel should be added to treat the acid mine condition (Shu *et at.,* 2001).

2.2.2 Specific gravity (G_S)

Because of the specific gravity (G_s) value depending upon a proportion of sulfide mineral (Hakkou *et al*., 2008), the G_s value of each sample were measured with a pycnometer, ASTM D854-00 Standard Test for Specific Gravity of Soil Solids by Water Pycnometer (ASTM, 2003)

2.2.3 Chemical composition

The presence of metals was determined by Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES), which was used to determine the element concentrations of the sample.

Method 3051A (U.S. EPA, 2007) is generally used as a guidance of the sample preparation prior to determining metals in solid samples by ICP-OES. Link *et al.* (1998) reported that the Method 3051A has been developed from the leaching method, Method 3051 and Method 3050B (U.S. EPA, 1998), to minimize the chemical bias and inefficiencies between these two methods.

The difference between Method 3051A and those two methods is that Method 3051A is added one more reagent, HCl, in the experiment. The adding of HCl, the ratio of HNO_3 to HCl is 9:3, enlarging the complexation and stabilization properties. For example, iron (Fe) which is frequently found in mine waste with Fe^{2+} and Fe^{3+} species (form $FeCl_4^{2+}$ and $FeCl^{4-}$, respectively) and both forms are stable in solution. As a result, in case of preparation waste rocks, the Method 3051A is generally used to determine the mineral composition (Cidu *et al.,* 2012; Kaakinen *et al.,* 2012).

2.3 Prediction methods for acid mine drainage

During the past 30 years, the predictive techniques have been used and developed by environmentalist to assess the acid generation potential and acid generation rate. However, the prediction test is very difficult and there is no standard method because the mine wastes have the heterogeneous nature. In addition, several chemical reactions can be in many forms and the interaction between mineral found in mine may occur (Cruz *et al.,* 2001). Normally, the processes of AMD prediction potential consist of 2 steps. Firstly, characterization the geological material and secondly, predict the AMD generation potential by the geochemical materials (i.e., waste rocks and mine tailings) (Sepsford and Willium, 2005). The commonly used techniques for AMD prediction potential are static and kinetic tests. The detail of each technique were described as follows:

2.3.1 Static test

Among the several techniques the static test has been popular because they are fast and inexpensive (Hakkou *et al.,* 2008a; Bouzahzah *et al.,* 2004; Bouzahzah *et al.,* 2009). There are many kinds of static test such as Acid-Base Accounting (ABA) method, paste pH and Net Acid Generation (NAG). However, these tests cannot provide the rate of acid generation potential (Changul *et al.,* 2010). The assumption of static test is the instant of acid generation and neutralization potential (Chotpantarat, 2011). The static test determines the AMD generation potential by measuring the balance between the Acidic Potential (AP) and Neutralization Potential (NP) of mine wastes (Cruz *et al.,* 2001; Benzaazoua *et al.,* 2004); consequently, this test may use to categorize mine wastes into “Potential Acid forming (PAF)”, “Non-Acid Forming (NAF)” and “Uncertainty (UC)” groups (Sepsford and Willium, 2005). However, the limitation of the static test is that it cannot classify the uncertainty group; consequently, it is impossible to clearly state the AMD generation potential in long-term period when the AMD generation potentials are fallen in the uncertainty group.

2.3.2 Kinetic test

For a better understanding of the geochemical behavior of waste rocks to reduce the adverse effect of AMD, the kinetic test has been conducted to complement the

static test (Benzaazoua *et al.,* 2004; Benzaazoua *et al.,* 2012; Buazahzah *et al.,* 2010; Changul *et al.,* 2010; Hakkou *et al.,* 2008a; Sepsford and Willium, 2005). According to Sapsford *et al.* (2008) the kinetic test can predict: (1) the rate of AMD generation (2) time of beginning of AMD (3) the chemistry of drainage and the resulting downstream loading for each toxic element under probable geochemical condition. Therefore, the kinetic test has been used in AMD management and prevention (Hakkou *et al.,* 2008a).

2.3.2.1 Humidity cell test

The humidity cells test is method that simulates the acid-consuming process that naturally occurs in the environment. Normally, waste rock sample (approximately 1 kilogram) is conducted into the seven-day cycle (52 cycles), consisting of 3 days of dry air circulation over the simple, 3 days of humid air circulation and flushing on the seventh day. This method is used to evaluate the rate of weathering for predicting the acid generation rate and neutralization potential (NP) depletion and lag time to AMD generation (Hakkou *et al.,* 2008; Sapsford *et al.,* 2008). Even the humidity cell test can provide the information of AMD generation potential, the amount of material in this test is high and take a long time. Thereby the environmentalists try to conduct other methods to complement these limitation.

2.3.2.2 Weathering cell test

The weathering cells test is method simulating the acid-consuming process that naturally occurs in environment, which is similar to humidity cell test. However, the method uses a thin layer of sample (approximately 67 grams of dry waste rock sample) and more frequent flushing-drying cycle than humidity cells test. The seven-day cycle (21 cycles) of weathering cell test consists of 2 days of exposure to ambient air, leaching on third day, 3 days of exposure to ambient air and leaching on the last day (Hakkou *et al.,* 2008; Cruz *et al.,* 2001; Plante *et al.,* 2011; Coussy *et al.,* 2012; Benzaazoua *et al.,* 2008).

CHAPTER III

METHODOLOGY

3.1 Study area

The gold mining site is located in the northeastern part of Thailand. The catchment located is mainly hill and flat plain with hills, and the surrounding land use are mostly agricultural land and followed by conserved forest and residential areas, respectively. It is bounded on the south and west by stream and bounded on the north and east by mountains .

Ores in this deposit have been classified into 2 groups as following:

(1) Gold ore

(2) Silver and copper ore

Gold ore can be divided into 3 zones depending upon ore zones and their physico-chemical properties as following:

3.1.1 Oxide zone

Oxide ore zone composed of gossan, oxidized skarn and gossanous sediment. The color of skarn varies from red-brown to dark-brown.

3.1.2 Transition zone

Transition ore is found between sulfide and oxide ore layers because incomplete oxidation; as a consequence, this ore composes by oxide ore and sulfide ore with an unpredictable ratio. The transition ore has been found in 5-40 meter depth.

3.1.3 Sulfide zone

Sulfide ore composed with skarn and massive sulfide, which is unoxidised sulfide-rich ore. The skarn found in various colors, i.e., dark-brown, green and green-grey while massive sulfide. pyrotite ($Fe_{1-x}S$) is the main component of this ore. Moreover, pyrotite may associate with other sulfide minerals such as pyrite (FeS_2), chalcopyrite ($CuFeS_2$).

Silver and copper ore are by-product from gold mining operation; however, there found in a few amount. After mine processing, mine waste can be divided into two broad classes of waste materials: mine tailings and waste rocks. The waste rocks have been deposited in three dump sites as following: oxidation dump, sulfide dump and transition dump depending on ore types as defined by depth.

3.2 Samplingf

The twenty-five mine waste samples were collected randomly in three dump sites (oxide, sulfide and transition dump sites). The waste rock samples were collected from all three dump sites and defined waste rock type by geologist (Table 3.1)

Table 3.1 Waste rock samples collected from a gold mine in Thailand

	Sample no.	Rock type
Oxide Dump	TKW-2	Limestone
	TKW-6	Limestone
	TKW-8	Andesite
	TKW-11	Andesite
	TKW-14	Siltstone
	TKW-15	Siltstone
	TKW-18	Mudstone
	TKW-19	Mudstone
	TKW-22	Gossan
Transition Dump	TKW-23	Gossan
	TKW-25	Andesite
	TKW-26	Andesite
	TKW-27	Andesitic tuff
	TKW-28	Andesitic tuff
	TKW-29	Andesitic tuff
	TKW-30	Breccia limestone
	TKW-59	Massive sulfide

	Sample no.	Rock type
	TKW-60	Massive sulfide
	TKW-61	Massive sulfide
	TKW-62	Massive sulfide
Sulfide Dump	TKW-39	Massive sulfide
	TKW-40	Skarn
	TKW-41	Skarn
	TKW-44	Andesitic tuff
	TKW-46	Mudstone

3.3 Prediction of acid mine drainage generation potential

Experiment were divided into two parts as follows (1) Physical-chemical Characterizations (2) Mine waste geochemical behavior and AMD generation potential interpretation (Figure 3.1) as following:

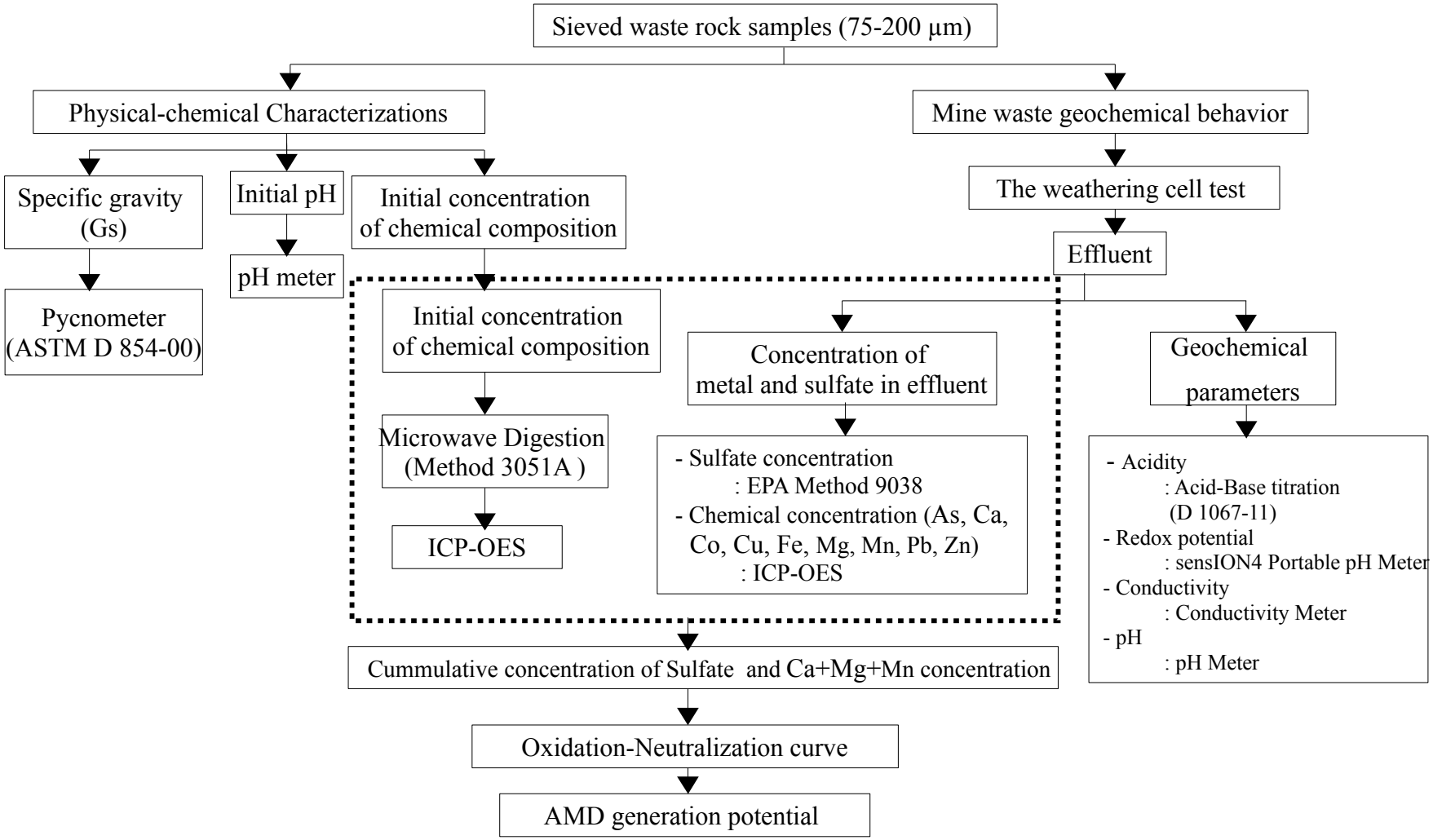

Figure 3.1 Experiment diagram

3.3.1 Physical-chemical Characterizations

In this part, different techniques were used to determine the physical-chemical properties as below.

3.3.1.1 Physical-chemical Characterizations

Specific gravity (G_s)

Specific gravity is the ratio of the mass of unit volume of soil at a stated temperature to the mass of the same volume of gas-free distilled water at a stated temperature. The specific gravity (G_s) was measured according to ASTM D 854-00 – Standard Test for Specific Gravity of Soil Solids by Water Pycnometer (ASTM, 2011).

pH

The initial pH of samples were measured using with ratio of 1:1 of waste rock and 0.01 mol/L $CaCl_2$ because this method provides a more robust measurement than a water matrix (Miller and Kissel, 2010; Schofield and Taylor, 1955). The pH was determined as following step. Five grams of dry waste rock samples, were added with 0.01 mol/L $CaCl_2$ and then were immediately measured by pH meter (sensION4 Portable pH Meter, HACH, U.S.A).

Grain size distribution

The grain size distribution analyzed by calculated from Cu (D_{60}/D_{10}), the coefficient of uniformity.

The initial concentration of heavy metal in waste rock

The waste rock samples were determined the initial and final concentrations of metal compositions, i.e., As, Ca, Co, Co, Fe, Mg, Mn, Pb and Zn, by ICP-OES (ULTIMA 2, HORIBA, Japan).

Due to the waste rock samples are a solid phase, microwave digestion Method 3051A (U.S. EPA, 2007) was conducted to digest the samples and the liquid samples were determined the chemical composition by ICP-OES (ULTIMA 2, HORIBA, Japan). The Method 3051 (U.S. EPA, 1994) is conducted to use even the limitation of this method is that a sample such as silicate may not be dissolved and remained after digestion. However, the

most chemical forms, which can adversely impact on surrounding environment, have been dissolved. Naturally, the bonding of silicate is a stable form and hardly to remove; thereby, the dissolution of silicate can be neglected because it has no environmental impact (Suthirat, 2011; Benzaazou *et al.,* 2004).

3.3.2 Mine waste geochemical behavior

The mine waste geochemical behaviors were evaluated during the weathering cell test; in addition, the effluent obtained from weathering cell tests was determined metal concentrations, As, Ca, Co, Cu, Fe, Mg, Mn, Pb and Zn by ICP-OES (ULTIMA 2, HORIBA, Japan)

The weathering cell test

The waste rock geochemical behavior was used to evaluate the AMD generation potential by weathering cell test, which Cruz *et al.*, (2001) has been first developed and later has been used as a tool for assessment AMD generation potential by Benzaazoua *et al.* (2008); Coussy *et al.* (2012); Hakkou *et al.*(2008a) and Plante *et al.* (2011).

This method is seven-day cycle (experiment duration ranged from August to December, Figure 3.2), consisting of two days exposure to ambient air, one day of leaching, three days of ambient air exposure and finally 1 day of leaching. Leaching was carried out by adding 50 milliliter deionized water to each sample twice a week. All samples was screened to < 75–200 μm, the finer fractions are responsible for most geochemical behavior of waste rock (Price and Kwong, 1997; Plante *et al.* 2011). The 67.5 grams of a sieved fraction (<75–200 μm) sample was settled, as a thin layer of sample, in a 55 milimeter diameter Buchner funnel (Figure 3.3). After 3 hours of adding deionized water to contact the waste rock samples, the leachate was recovered by using a vacuum suction pump.

The effluent derived from the weathering cell test was filtered through a 0.45 μm nylon filter. The leaching solution from each waste rock sample was analyzed the geochemical properties. The acid-base titration was used to measure an alkalinity and acidity, ASTM D1067-11 (ASTM, 2011). The sensION4 Portable pH Meter was used to determine the redox potential, the results were corrected to a standard hydrogen electrode (SHE) to obtain Eh, express in mV. The conductivity meter were used to determined the electrical conductivity (EC), express in μS/cm. Two M HNO_3 were

added to filtered leachates to acidify and prevent the metal precipitation (Dutta *et al.,* 2009). The effluent obtained from the weathering cell test was evaluated sulfate concentration according to method 9038, sulfate (turbidimetric) (EPA, 1986). The cumulative concentration of sulfate was used to plot with sum Ca+Mg+Mn to predict the AMD generation potential in the last stage of experiment.

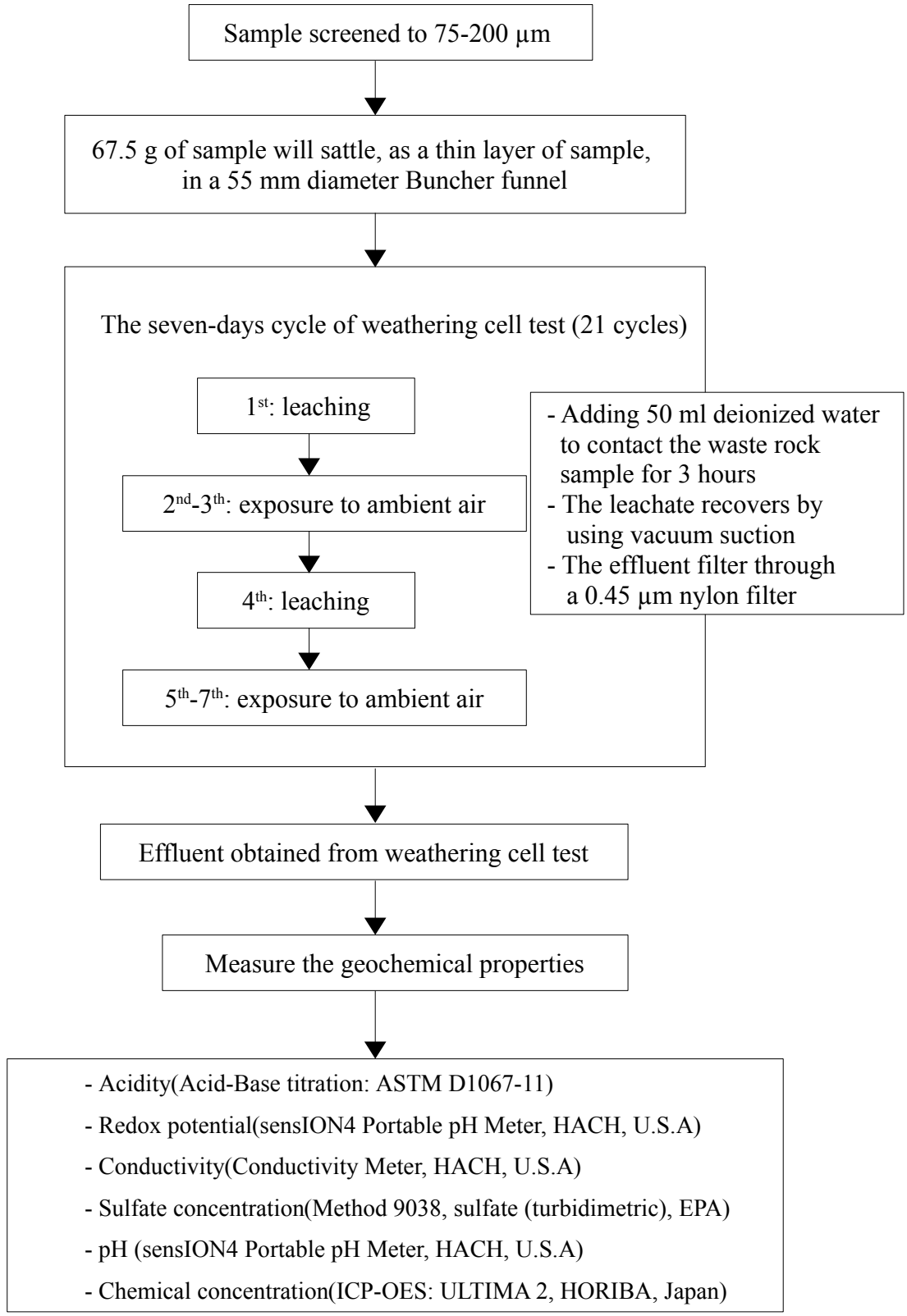

Figure 3.2 Flow diagram of the weathering cell tests

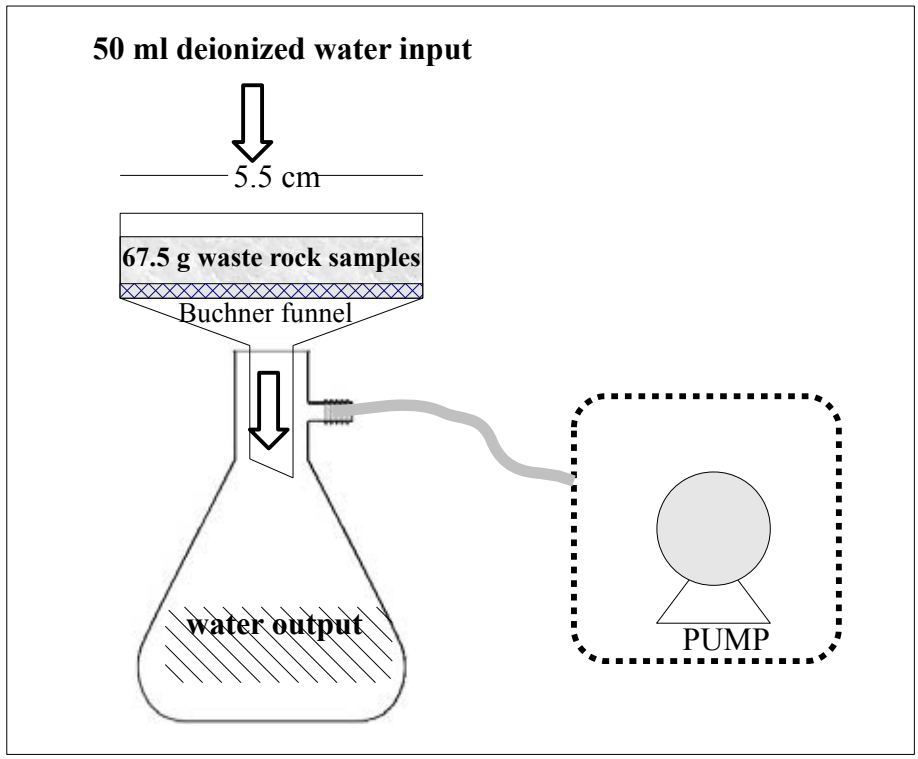

Figure 3.3 Schematic diagram of the weathering cell test

Long term assessment of AMD generations

The AMD generation potential can be predicted for long periods by using oxidation-neutralization curve (Plant *et al.,* 2011; Hakkou *et al.,* 2009; Benzaazoua *et al.,* 2004). The kinetic test results, sulfate and sum of Ca, Mg and Mn, were used as main oxidation product and main carbonate dissolution product, respectively. The cumulative concentration of sulfate (x-axis) and Ca+Mg+Mn (y-axis), express per kilograms of waste rock, were plotted. The obtain curve was "oxidation-neutralization curve" (Figure 3.4). This curve shows relationship between the sulfide oxidation product, cumulative sulfate concentration, with acid neutralization, Ca+Mg+Mn. When such curve revealed linear line, it means that the ratio of neutralization and oxidation product stay the same, suggesting the mineralogy (depletion and precipitation) will not affect to the geochemical environment in a long term (Benzaazoua *et al.*, 2004).

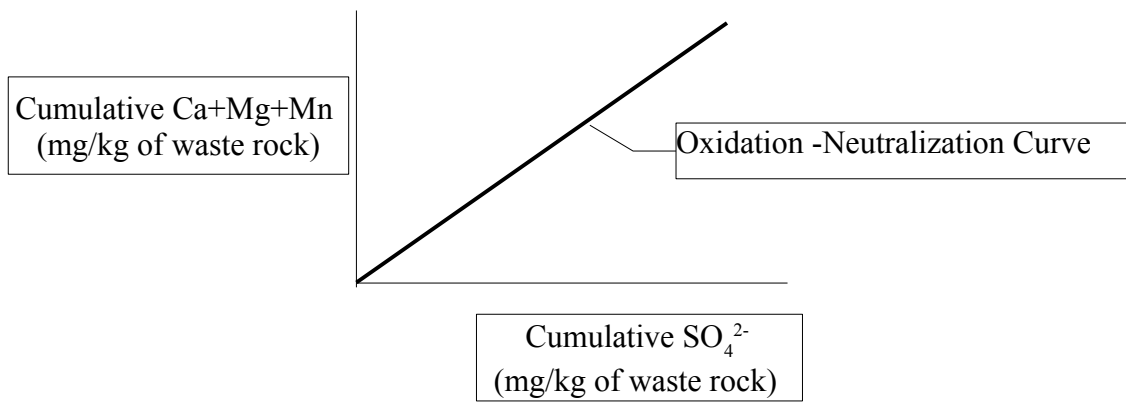

Figure 3.4 The oxidation-neutralization curve

CHAPTER IV

RESULTS AND DISCUSSION

The results obtained from the experiment were reported in this chapter in order to explain the geochemical behavior of waste rock in three dump sites, oxide, sulfide and transition dump sites. The conclusion of experiment was to predict the AMD generation potential of all waste rock samples.

4.1 Physical properties

Twenty five waste rock samples from three dumps sites (oxide, transition and sulfide dump site) were classified types of waste rock by the mining geologist. The sample used in the experiment was sieved through mesh sieve under various sizes between 75-200 μm. Specific gravity (G_s) and grain size properties of wastes rock sample were given in Table 4.1. The specific gravity (G_s), value of each sample measured by a pycnometer, ASTM D854-00 Standard Test for Specific Gravity of Soil Solids by Water Pycnometer (ASTM, 2003). The G_s shows in the Table 4.1 may use to indicate the mineralogy. The greater values of G_s may show the greater ratio of sulfide minerals (Hakkou *et al.,* 2008). Grain size distributions were also shown in Table 4.1, and found that grain size properties in three dump sites were similar. The C_u (D_{60}/D_{10}), the coefficient of uniformity showing the grain size were well distributed (1.134-1.217). However, the samples used in the experiment were selected between 75-200 μm (sieve through mesh sieve no. 200 and no. 60). Sample used in the weathering cell test should have a similar size because finer sample are corresponding to the large proportion of surface area; therefore, it significantly increases the surface area of sample. The increasing of surface area can increase the potential of sample to expose to atmospheric condition which can increase AMD drainage generation potential (Hakkou *et al.,* 2008; Plante *et al.* 2012; Price and Kwong, 1997).

Table 4.1 Physical characteristics of the waste rock samples

	Sample no.	Rock type	G_s	D_{60}	D_{50}	D_{10}	D_{60}/D_{10}
Oxide Dump	TKW-2	Limestone	2.79	2.425	2.346	2.030	1.195
	TKW-6	Limestone	2.62	2.368	2.280	1.944	1.216
	TKW-8	Andesite	2.89	2.329	2.255	1.959	1.189
	TKW-11	Andesite	2.75	2.423	2.351	2.061	1.176
	TKW-14	Siltstone	2.80	2.379	2.302	1.993	1.193
	TKW-15	Siltstone	2.82	2.380	2.308	2.020	1.178
	TKW-18	Mudstone	2.75	2.392	2.316	2.009	1.191
	TKW-19	Mudstone	3.00	2.396	2.299	2.017	1.174
	TKW-22	Gossan	2.77	2.289	2.212	1.901	1.205
Transition Dump	TKW-23	Gossan	2.74	2.351	2.274	1.963	1.197
	TKW-25	Andesite	2.70	2.246	2.171	1.874	1.198
	TKW-26	Andesite	2.60	2.239	2.262	1.998	1.165
	TKW-27	Andesitic tuff	2.79	2.279	2.210	1.932	1.180
	TKW-28	Andesitic tuff	2.66	2.387	2.302	1.961	1.217
	TKW-29	Andesitic tuff	2.75	3.144	3.069	2.772	1.134
	TKW-30	Breccia	2.84	2.318	2.252	1.986	1.168
	TKW-59	Massive	3.92	2.270	2.195	1.895	1.198
	TKW-60	Massive	4.04	2.251	2.174	1.867	1.206
	TKW-61	Massive	4.31	2.252	2.179	1.883	1.196
	TKW-62	Massive	3.82	2.237	2.163	1.870	1.196
Sulfide Dump	TKW-39	Massive	4.32	2.318	2.244	1.950	1.189
	TKW-40	Skarn	3.65	2.259	2.187	1.899	1.190
	TKW-41	Skarn	3.73	2.232	2.157	1.857	1.202
	TKW-44	Andesitic tuff	3.13	2.313	2.243	1.961	1.180
	TKW-46	Mudstone	2.50	2.339	2.267	1.878	1.182

4.2 Chemical properties of waste rocks

The chemical properties of waste rock samples (Table 4.2) shows the compositions of the waste rock sample analyzed by ICP-OES (ULTIMA 2, HORIBA, Japan). The dominant compositions of these waste rocks were Ca and Fe. The average concentration of Fe in each dump site can be ranged in the following order: sulfide dump (22.906 wt%) > transition dump (8.633 wt%) > oxide dump (0.870 wt%). The average concentration of Ca in each dump site can be ranged in the following order: transition dump (6.354 wt%) > sulfide dump (1.583 wt%) > oxide dump (1.364 wt%). Contents of Mg, Mn and Cu were (wt%) lower than contents of Fe and Ca. In additional, low concentrations of As, Pb and Zn were also present as shows in the Table 4.2 (mg/L). Average sulfur content in waste rock samples in oxide, transition and sulfide dump sites were 0.25, 6.37, 7.84 wt% , respectively.

The initial pH of each sample were measured also show in Table 4.2. The initial pH of most samples were neutral to alkalinity (pH > 7); however, some samples had pH values ranged from 5 to 7. Nevertheless, in TKW-23 (gossan) had very low pH level.

Table 4.2 Chemical composition of studies waste rock.

Location	sample	pH	Fe (wt%)	Mg (wt%)	Mn (wt%)	Cu (wt%)	Ca (wt%)	Zn (mg/kg)	Pb (mg/kg)	Co (mg/kg)	As (mg/kg)	S (wt%) *
Oxide Dump	TKW-2	8.09	0.4137	0.8550	0.0002	0.0150	0.4043	21.1000	14.1000	21.1000	1.6000	0.04
	TKW-6	8.13	0.0285	0.1108	0.0039	0.0062	5.3600	9.0000	1.9000	78.2000	0.5000	0.04
	TKW-8	8.02	3.9441	0.9144	0.0229	0.0080	1.9994	49.8000	4.0000	29.2000	15.6000	0.05
	TKW-11	8.17	0.0696	0.0209	0.0029	0.0393	0.0402	4.5000	54.8000	264.2000	10.7000	0.05
	TKW-14	8.00	3.2418	1.3799	0.0460	0.0020	0.5759	12.6000	2.2000	19.5000	4.2000	0.25
	TKW-15	7.72	3.5880	0.7460	0.0062	0.0325	0.1590	8.4000	2.2000	36.6000	4.9000	0.40
	TKW-18	8.18	0.7002	0.8807	0.0249	0.0015	2.7109	28.9000	3.4000	9.3000	5.6000	0.03
	TKW-19	8.11	3.3804	0.8456	0.0331	0.0006	0.3781	9.4000	1.8000	2.3000	7.1000	0.17
	TKW-22	6.17	0.0026	0.0199	0.0006	0.0188	0.6511	6.6000	1.6000	12.5000	2.9000	1.27
Transition Dump	TKW-23	3.14	46.2280	0.8230	0.3440	8.4218	0.0444	106.9000	621.7000	430.1000	0.0000	0.60
	TKW-25	7.99	0.0090	0.0358	0.0000	0.0035	2.0499	8.8000	0.0000	32.0000	2.4000	0.26
	TKW-26	7.79	0.1562	0.1016	0.0009	0.0022	1.0791	0.4000	0.9000	46.6000	5.9000	0.05
	TKW-27	7.91	0.1609	0.1405	0.0037	0.1417	0.3352	1.8000	4.5000	342.1000	8.7000	0.00
	TKW-28	8.32	0.1642	0.0069	0.0035	0.0049	1.9972	1.3000	1.1000	24.7000	0.0000	0.34
	TKW-29	8.36	1.9188	0.9430	0.0219	0.0054	0.2373	55.0000	13.5000	24.4000	59.7000	0.19
	TKW-30	8.44	2.9257	0.6336	0.0709	0.0128	2.6067	40.9000	6.6000	16.9000	2.1000	0.33
	TKW-59	7.96	39.02	0.5374	0.1568	5.1498	9.6000	1199.7000	471.2000	896.1000	0.0000	33.00
	TKW-60	7.85	39.8270	1.0780	0.4750	5.1367	35.6540	225.5000	272.0000	510.8000	4.8000	13.60
	TKW-61	5.69	41.86	0.3531	0.0840	3.1278	1.5900	1263.0000	470.0000	925.3000	0.2204	32.85
	TKW-62	6.99	3.5722	0.9672	0.2703	11.3394	14.7000	1704.9000	458.7000	577.0000	28.7000	21.51
Sulfide Dump	TKW-39	7.89	63.1670	4.8802	0.5511	0.1803	1.3672	1121.0000	304.4000	79.7000	6.8000	34.46
	TKW-40	7.96	21.4494	0.0528	0.1018	0.0029	2.3208	2353.9000	13.5000	28.5000	7.6000	3.45
	TKW-41	8.44	17.7545	0.0752	0.1135	0.0126	2.5158	36.2000	10.8000	18.4000	8.7000	0.22
	TKW-44	8.81	8.0097	0.4560	0.1140	0.0256	1.3764	74.1000	10.0000	16.7000	3.8000	0.95
	TKW-46	7.34	4.1501	0.8685	0.0262	0.0010	0.336	54.3000	6.2000	18.3000	3.0000	0.11

*S (wt%) (Changul, personal communication)

4.3 The geochemistry of leaching from the weathering cell tests

This section explained the geochemical behavior of the waste rock samples The physico-chemical parameters, pH, redox potential (Eh expressed in mV) and conductivity (EC expressed in μS/cm), were measured in the effluent obtained from each cycle of the weathering cell tests. The major and trace metals (i.e. As, Ca,Co, Cu, Fe, Mg, Mn, Pb, Zn) and sulfate (SO_4^{2-}) results were expressed in mg/L. The sulfate concentration represented the oxidation product while Mg, Mn, Ca represents the neutralization product; these two groups were used to determine the long term acid generation potential.

4.3.1 Oxide dump site

4.3.1.1 General result in waste rocks derived from oxide dump

The pH value of samples in this dump site were neutral to slightly alkalinity (pH~7-9, Figure 4.1a) and low Eh values (~10-500 mV, Figure 4.1b). Samples in this dump site had low EC values (Figure 4.1c) which changed in a first few cycles of the weathering cell test. Acidity in waste rocks obtained from oxide dump site was low.

The solubility of heavy metal relies on water quality parameters, which are pH and Eh values (Weiner, 2012). The metal solubility increases under low pH condition. The Eh value also affect on the metal solubility. The Eh value in these samples not significantly increase, indicating that desirable condition for sulfide oxidation did not happen (Benzaazoua *et al.,* 2004). The EC value measured in the leaching is also quite low, demonstrating dissolution levels of minerals in leachates were low (Benzaazoua *et al.,* 2004).

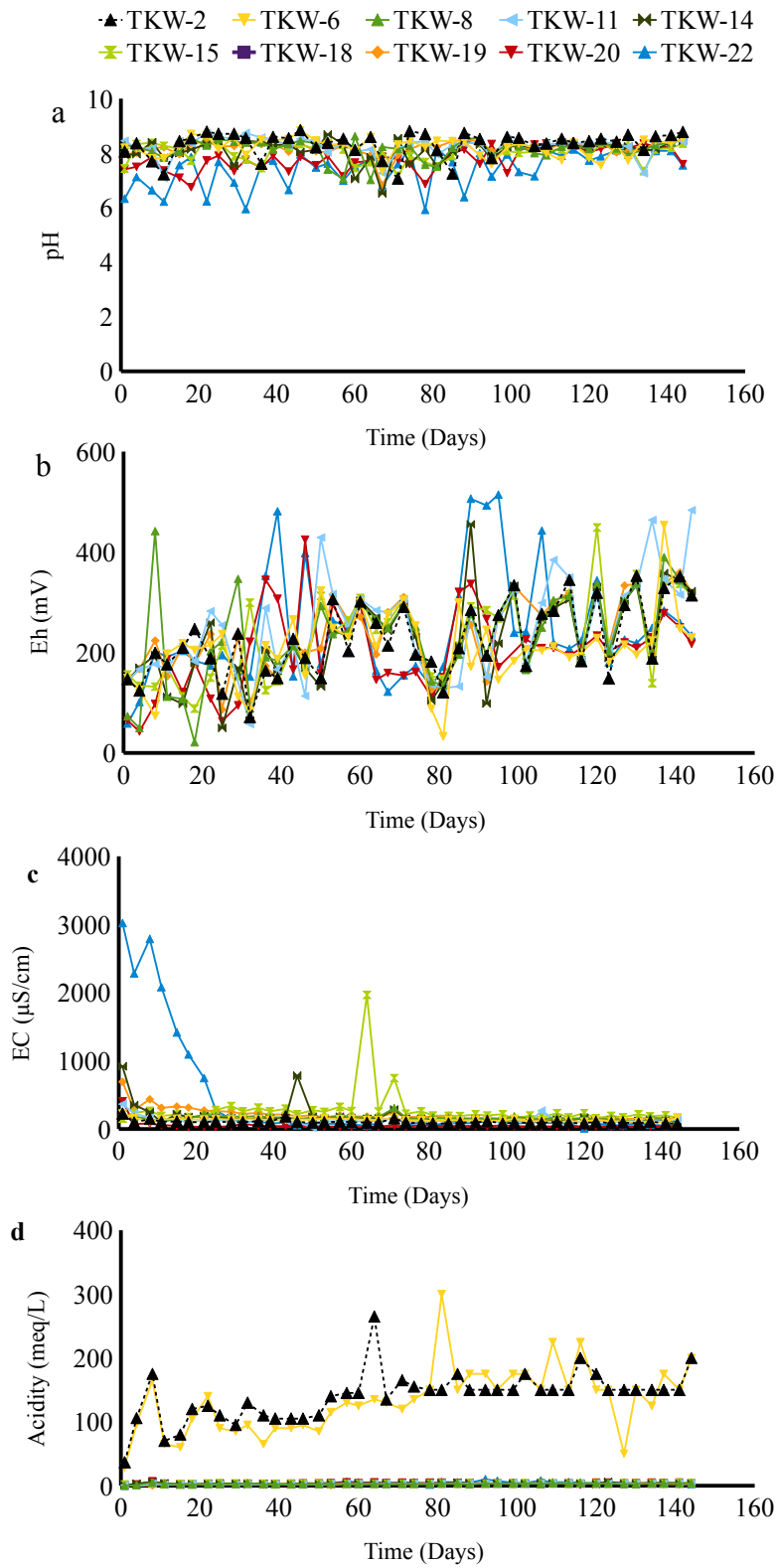

Figure 4.1 Evolution of pH, redox potential (Eh), conductivity (EC) from in weathering cell tests of waste rocks from oxide dump site

4.3.1.2 Specific results in waste rocks derived from oxide dump

In oxide dump site had 11 samples (Table 4.1) which were limestone, andesite, siltstone, mudstone and gossan. The results of these samples were selected as representatives (i.e. TKW-2, 8, 14, 18 and 22) as below:

1) TKW-2

pH and redox potential variation

The geochemical behavior of TKW-2, limestone, was explained by using many parameters from the weathering cell test. The pH values of leachate were neutral to slightly alkaline (pH~7-9) with average pH of~8.34 and low Eh values (71.00-352.70 mV) with average Eh of 226.545 (Figure 4.2a) that suggest that TKW-2 was not short-term acid producers. The EC values were low (73.50-227.00 µS/cm) with average EC of 103.99 µS/cm (Figure 4.2b), low SO_4^{2-} value (3.90-45.68 mg/kg) (Figure 4.2m).

Acidity

The acidity level (Figure 4.2c) was positively correlated with releasing of heavy metals. The acidity values was not high (0.73-5.30 meq/L) and the low concentration of heavy metals.

Arsenic

The initial concentration of As is only 1.6 mg/L; however, one of very importance process to mobilize As into mine water is desorption from particular at high pH (pH>8.5) under oxidizing condition. Therefore the solubility of As is low (reached 0.095 mg/L, Figure 4.2d).

Fe

Concentrations of Fe (Figure4.2e) in the leachate were low (reached~0.325 mg/L) because the solubility of these elements increase under low Eh value (reducing condition) and low pH.

Calcium, magnesium and manganese

Amount of dissolved element such as Ca concentrations (Figure 4.2f) were not high (ranged from 0.151 to 8.314 mg/L) and can reach 13.254 mg/L. The low EC values measured in the leachate (ranged from 227.00 to 73.50 µS/cm) was responsible for some cations, such as Mg (Figure 4.2g) which were low (reached 3.937 mg/L). Mn in the leachate was low (reached 0.033mg/L), The solubility of these elements increase because of the low Eh value (reducing condition) and low pH.

These elements contained carbonate minerals when sulfide mineral oxidize (such as pyrite), these elements also dissolved (Benzaazoua *et al.,* 2004). During the experiment, pH of the effluent was high because the neutralization of these elements (Benzaazoua *et al.,* 2004).

Copper, cobalt, lead and zinc

The Co, Cu, Pb, Zn can reach, respectively, 0.081, 0.220, 0.033, 0.128 mg/L because these elements were released in low pH; therefore, the concentration of these elements were low (Figure 4.2h-k).

Sulfates

The SO_4^{2-}(Figure 4.2m) are responsible for level of EC levels. The low EC values measured in the leachate, in the same way as SO_4^{2-} which was not high (reached 45.673 mg/kg). In addition, sulfur content in the sample was only 0.04%, and SO_4^{2-} produced by the oxidation of sulfides (Benzaazoua, 2004; Hakkou *et al.,* 2008).

2) TKW-6

TKW-6, limestone, can be explained as similar as the TKW-2 because this sample was the same waste rock types and had also a similar geochemical properties.

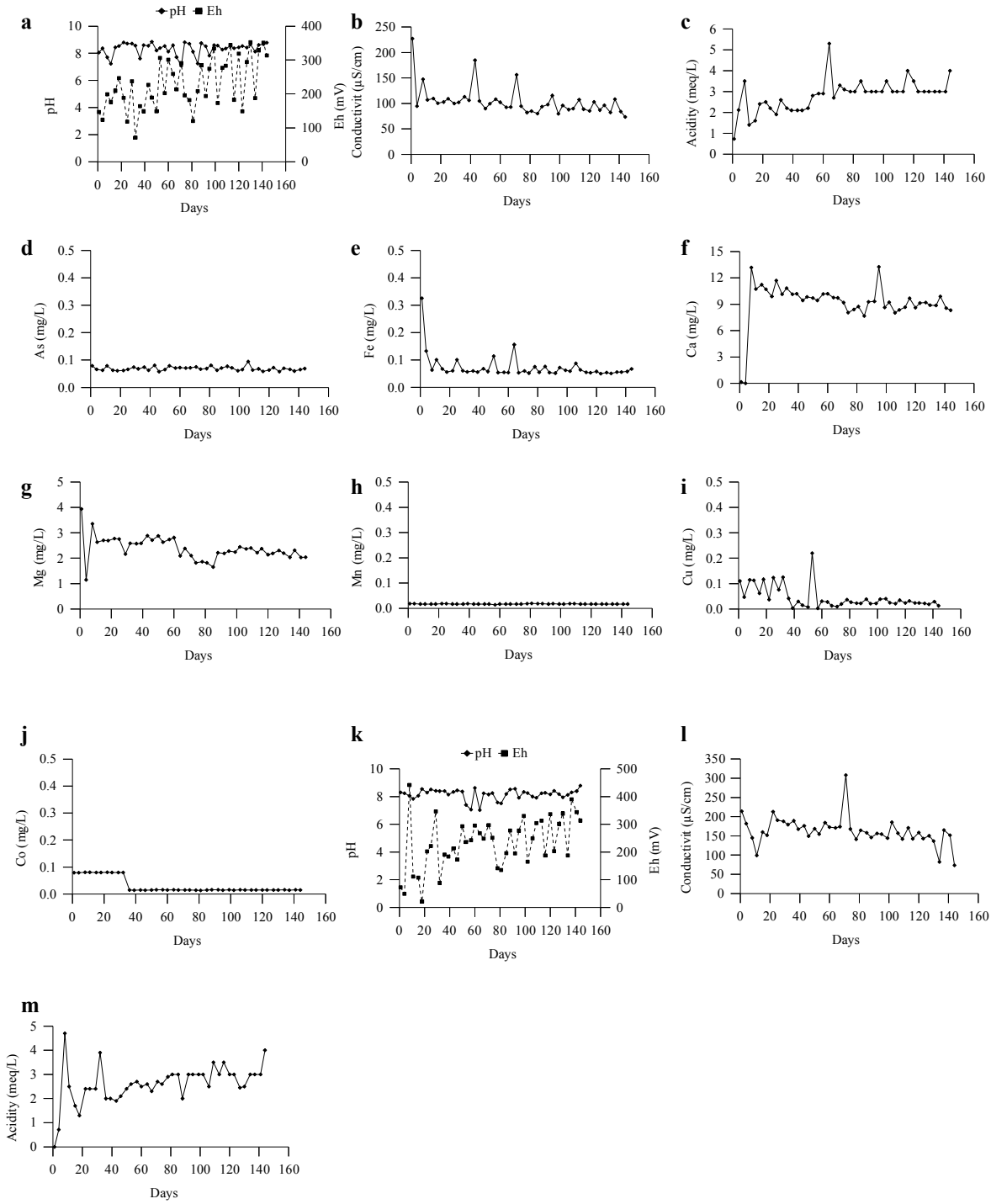

Figure 4.2 Water quality from the weathering cell tests on TKW-2 sample

3) TKW-8

pH and redox potential variation

The pH values in TKW-8 (andesite) were high (pH~7-9) with average pH of ~8.16, EC values were (73.50-308.00 µS/cm) with average Eh of 231.90 µS/cm, low Eh values (21.20-441.50 mV) with average Eh of 226.545 mV (Figure 4.3a-b).

Acidity

The acidity (Figure 4.3c) was not high and was responsible for the low concentration of trace elements in the leachates obtained from weathering cell tests.

Arsenic

The concentrations of As (Figure 4.3d) which the solubility increased in oxidizing condition (Weiner, 2012) were not high. The concentrations of As were dropped in the last few cycles because the initial concentrations were low (~10.70 mg/L).

Iron

The solubility of Fe (Figure 4.3e) increase in the few first cycle when Eh values increase in the same period (~441.50 mV). For this reason, even Fe initial concentration was quite high (39,441.40 mg/L), Fe released from the leaching at the end of experiment was very low (reached 6.20 mg/L).

Calcium, magnesium and manganese

Concentrations of dissolved elements such as Ca, Mn (Figure 4.3f,h) were not high and can reach 25.859, 4.799 mg/L, respectively which was higher than that in TKW-2 sample. Magnesium (Figure4.3g) concentration ranged from 0.053 to 0.511 mg/L and can reach 4.799 mg/L, which were not different from that of TKW-2.

Copper, cobalt, lead and zinc

The concentration of Co, Cu, Pb, Zn were low (Figure 4.3h-j) which can reach, respectively, 0.101, 0.119, 0.040, 0.221 mg/L because these elements were released under low pH condition.

Sulfates

The SO_4^{2-} (Figure 4.3m) were corresponding levels of EC. The SO_4^{2-} concentration reach a peak during 60-80 days of experiment, this evidence would coincide with the highest of EC values.

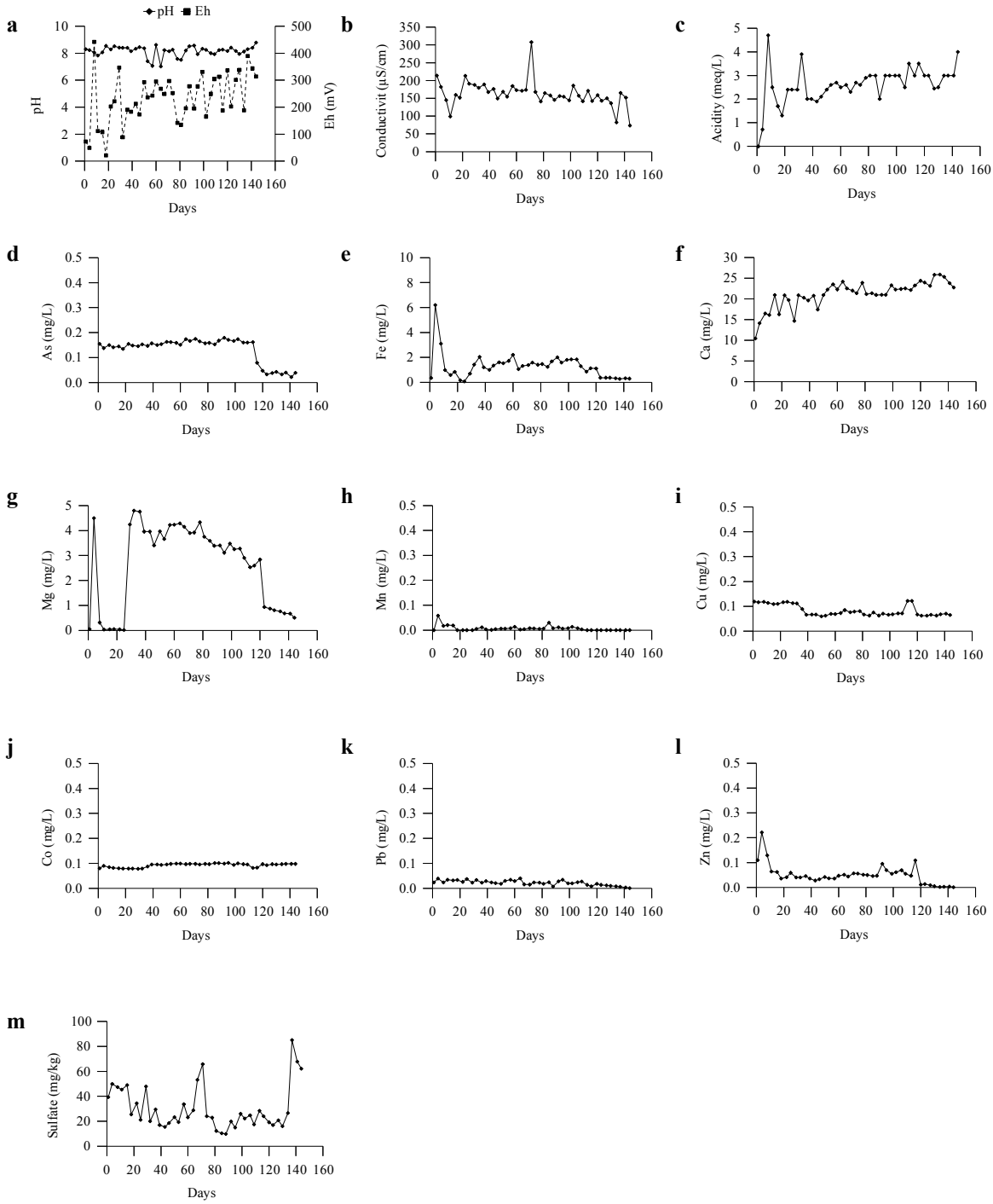

Figure 4.3 Water quality from the weathering cell tests on TKW-8 sample

4) TKW-11

The TKW-11 was the same type of waste rock as TKW-8, andesite. Therefore the geochemical behavior of TKW-11 can be explained in the same way as TKW-8.

5) TKW-14

pH and redox potential variation

TKW-14, siltstone, had pHs ranged between 6.5 and 8.9 which are quite high. The Eh values and EC values were wildly ranged (49.80-455.30 mV and 99.10-918.00 μS/cm, respectively) (Figure 4.4a-b).

Acidity

The acidity (Figure 4.4c) of this sample was not high in the same way as pH and the low concentration of element in the leachate.

Arsenic

The concentration of As (Figure 4.4d) reached 0.144 mg/L. The solubility of As is responsible for high value of Eh , oxidizing condition. From the Figure 4.3a, the pH and the Eh values were not high; therefore, the concentration of As was low.

Fe

The concentration of Fe (Figure 4.4e) reached 2.248 mg/L because these elements increase their solubility with low pH and under reducing condition.

Calcium, magnesium and manganese

Cu, Mg ang Mn (Figure 4.4f-h) also low (reached 0.018, 5.604, 0.125 mg/L, respectively) because these element increase their solubility with low pH and under reducing condition.

Copper, cobalt, lead and zinc

The concentration of Cu, Co, Pb and Zn (Figure 4.4i-k) increase when pH is low because these elements are redox-insensitive metal; therefore, their solubility is not responsible for the Eh values. The pH of this sample was not high; therefore, concentration of Pb and Zn in the leachate were not high (reached 0.118, 0.103, 0.235 and 0.439 mg/L, respectively).

Sulfates

The sulfate (Figure 4.3m) concentrations in the leachate were high (reached 88.825 mg/kg) and related to the Eh values and EC value which were increased between the experiment (in 40^{th}-60^{th} day). In addition the high value of sulfate was corresponding with the initial sulfur content (0.25 wt%), which was higher than those in previous oxide samples (TKW-2, 4, 8 and 11).

6) TKW-15

The TKW-15 was the same type of waste rock as TKW-14 (siltstone). The results of the geochemical characteristics of TKW-15 showed the similar as those of TKW-14.

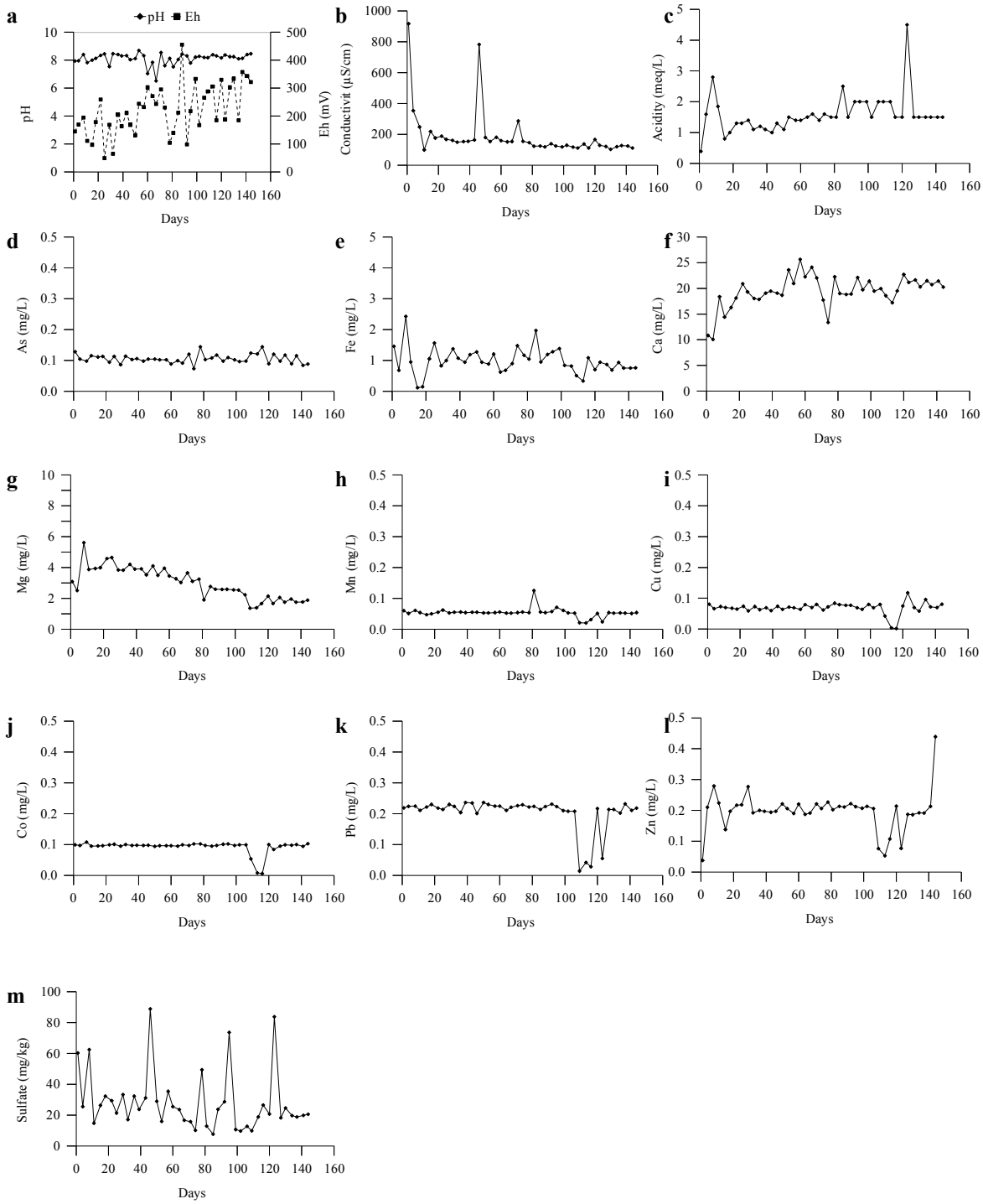

Figure 4.4 Water quality from the weathering cell tests on TKW-14 sample

7) TKW-18

pH and redox potential variation

The pH in TKW-18 (Mudstone) was high (pH~7-9) with average pH of ~8.23, EC values were between 73.50-308.00 µS/cm with average EC of 129.27 µS/cm, low Eh values (21.20-441.50 mV) with average Eh of 240.57 mV (Figure 4.5a-b).

Acidity

The acidity (Figure 4.5c) was not high (average 2.56 meq/L) which is relate to the low concentration of trace element in the leachate obtained from the weathering cell test.

Arsenic

The concentration of As (Figure 4.5d) which the solubility increased in oxidizing condition (Weiner, 2012) was not high. The concentration of As was instantaneously dropped after the first to remain at low concentration (approximately 0.090-0.130 mg/L).

Iron

The solubility of Fe (Figure 4.5e) increases when value of pH and Eh values are low; even Fe initial concentration was quite high (7,001.60 mg/L), Fe obtained from the leaching was very low (reach 1.350 mg/L with average 0.183mg/L).

Calcium, magnesium and manganese

The amount of dissolved element such as Ca (Figure 4.5f) concentration was high in the first fewcycle of experiment (~40.525 mg/L); however, it rapidly decreased the solubility to remain at approximately 18.000-20.000 mg/L during the experiment. Mg and Mn (Figure 4.5g,h) were low and reached ~4.821 and 0.052 mg/kg, respectively.

Copper, cobalt, lead and zinc

The Co, Cu, Pb, Zn concentrations of these elements were low (Figure 4.5i-l) which can reach, respectively, 0.100, 0.118,0.246, 0.374 mg/L because these element were released in low pH.

Sulfates

The SO_4^{2-} (Figure 4.5m) concentrations which had a peak during days 110th-120th day of experiment (reached 95.481 mg/kg). The oxidation of sulfides produces sulfate by the water and oxygen in atmosphere reacted with sulfide minerals (Benzaazoua, 2004). Oxygen acts as an oxidizing reagent (Nicholson *et al.,* 1989). The Eh values showed the highest peak (~460 mV) in the same period (110th-120th day), which can explain the oxidizing condition in the effluent. The sulfate concentrations had an effect on the solubility of trace elements, such as Fe, Mg, Mn, Pb, Zn, Co, Cu and Ca, which can react sulfate and precipitate as metal sulfides (insoluble metals). The metal sulfides generally is insoluble; therefore the concentration of soluble element in effluent was decreased. For instant in high concentration of sulfate, it can be reduced to sulfide and react with Mn to form Mn sulfides, which reduce the solubility of Mn in effluent (Weiner, 2012). As shown in the Figure 4.5h**,** the concentration of sulfate was high during days 110th-120th of experiment, the same period as the concentration of Mn was rapidly dropped (to 0.049 mg/L).

8) TKW-19

The TKW-19 (mudstone) can be explained the geochemical behaviors as similar as those of the TKW-18 because this sample was the same waste rock type and had also a similar geochemical properties.

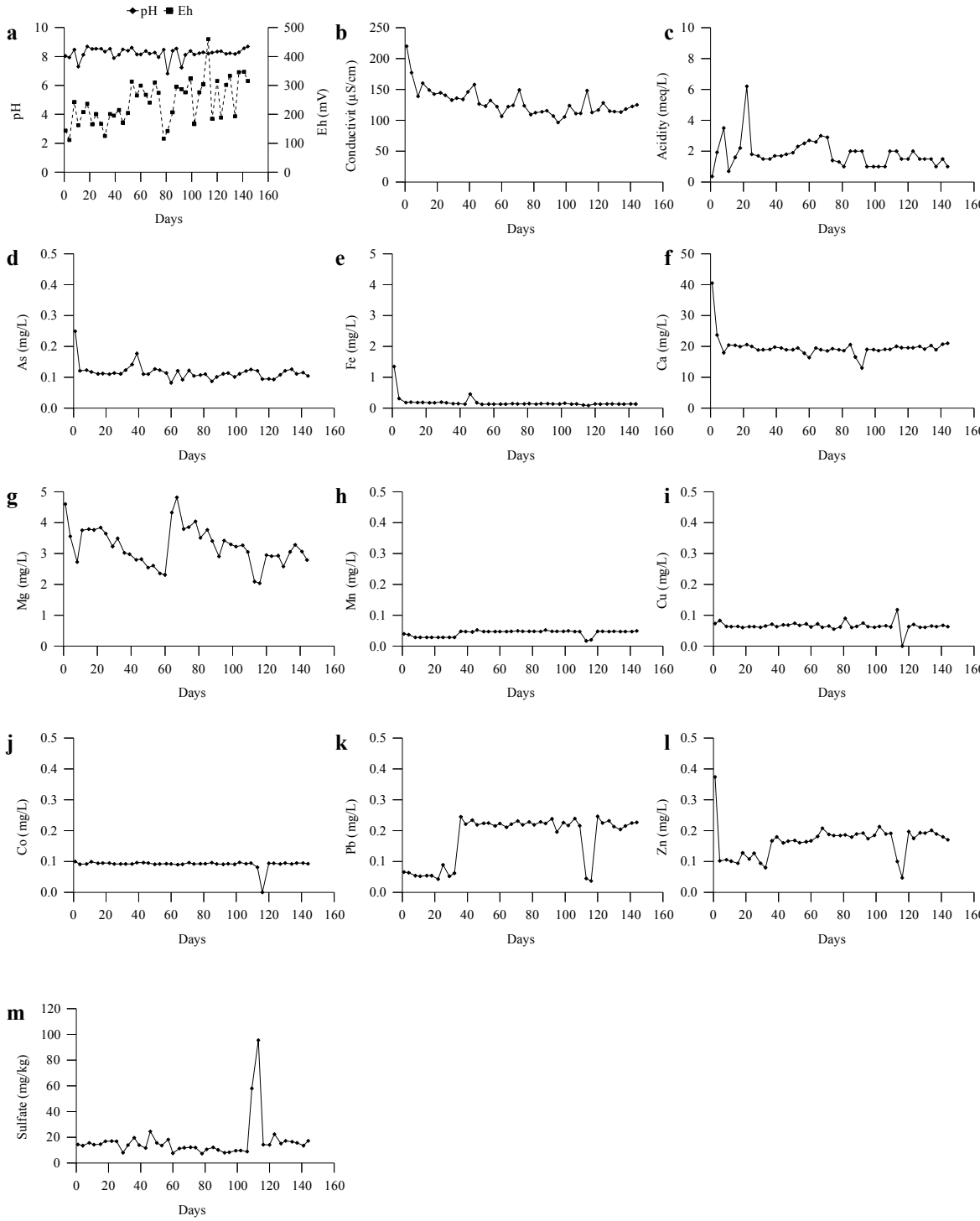

Figure 4.5 Water quality from the weathering cell tests on TKW-18 sample

9) TKW-22

pH and redox potential variation

TKW-22 (gossan) had a different geochemical behavior among the waste rock sample in the same dump site. The pH had neutral pH values (~6-8), which were lower than those of other samples in the same dump site. The EC values were high in the few first cycles and decreased and stabilized after 30 days (from 3,020.00 to 233.30 µS/cm) (Figure 4.6a-b). Even the pH, Eh and EC values were different from the other samples, the concentration of trace elements in this sample was still low.

Acidity

The acidity values of this sample were the highest (~10 meq/L) among samples in oxide dump site (Figure 4.6c). The acidity slightly increased after approximately 30th day of experiment because the neutralization products (i.e., Ca, Mg, Mn) were run out.

Arsenic

The concentrations of As (Figure 4.6d) were not high (range from 0.000 to 0.158 mg/L) because the As solubility increased in oxidizing condition (Weiner, 2012).

Iron

Fe concentration (Figure 4.6e) increased, during approximately 40th- 90th day of experiment, and decreased to low values after approximately 100th day. The Fe concentrations were positively correlated to Eh values.

Calcium, magnesium and manganese

Concentrations of Mg (Figure 4.6g), were closely correlated to level of EC values. The EC values measured in the first few cycles of the experiment were high, which conformed to Mg concentrations with having high concentration at the first few cycles (reached ~34.26 mg/kg). Concentrations of dissolved elements such as Ca, Mn (Figure 4.2 f,h) were not high and reached ~8.485, 2.474 mg/L.

Copper, cobalt, lead and zinc

Because Co, Cu, Pb, Zn concentrations are released in low pH, the concentration of these elements were low (Figure 4.6i-l) which can reach,

respectively, ~0.084, 0.143, 0.106, 0.625 mg/L.

Sulfates

The SO_4^{2-} concentration (Figure 4.6m) and EC values (Figure 4.6b) had similar trend. The concentrations of SO_4^{2-} were high in the earliest stage of the experiment and decreased after 40th day. Even the SO_4^{2-} also depends on Eh values, the Eh value which increased in the middle to last stage of experiment was not affected on the solubility of SO_4^{2-}. This evidence can be explained by the initial sulfur content which was not quite high (1.27%) and may ran out in the earliest stage of experiment. The solubility of Fe increases when pH and Eh values are low. During approximate the 50th- 60th day of experiment, the Eh values were low, which was the same period with Fe had high concentration (reached ~38.367 mg/L).

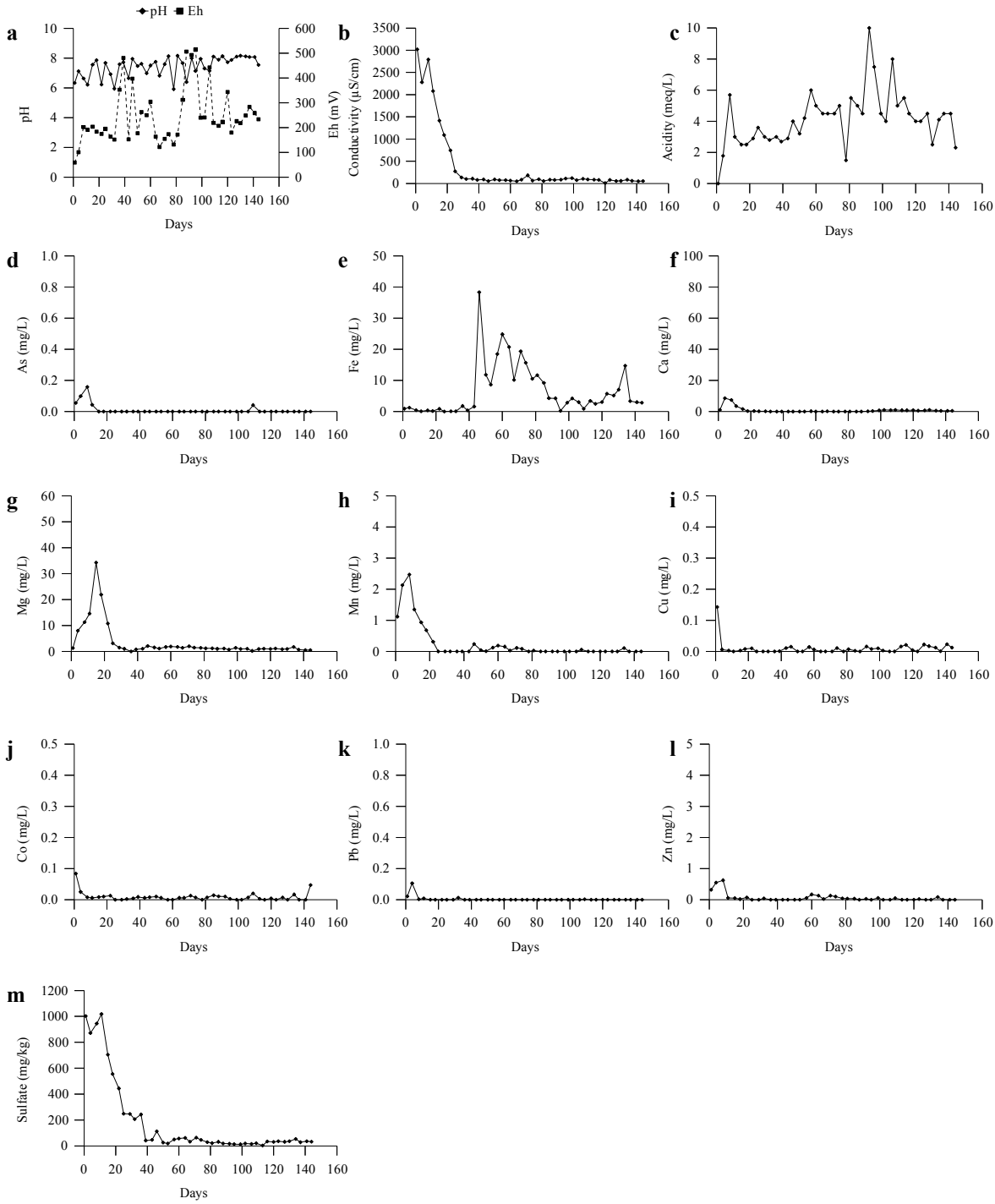

Figure 4.6 Water quality from the weathering cell tests on TKW-22 sample

4.3.2 Transition Dump Site

4.3.2.1 General result in waste rocks derived from transition dump

The pH value of samples in this dump site were widely ranged from very acidic to alkaline condition (pH ~3-9, Figure 4.7a), low Eh values (~10-500 mV, Figure 4.7b), EC values (~10-1000 µS/cm, Figure 4.7c) and high avidity (Figure 4.7d). Samples in this dump site had the lowest pH level among all three dump sites; therefore, the concentration of released elements in effluent of this dump site were higher than those of two dump sites.

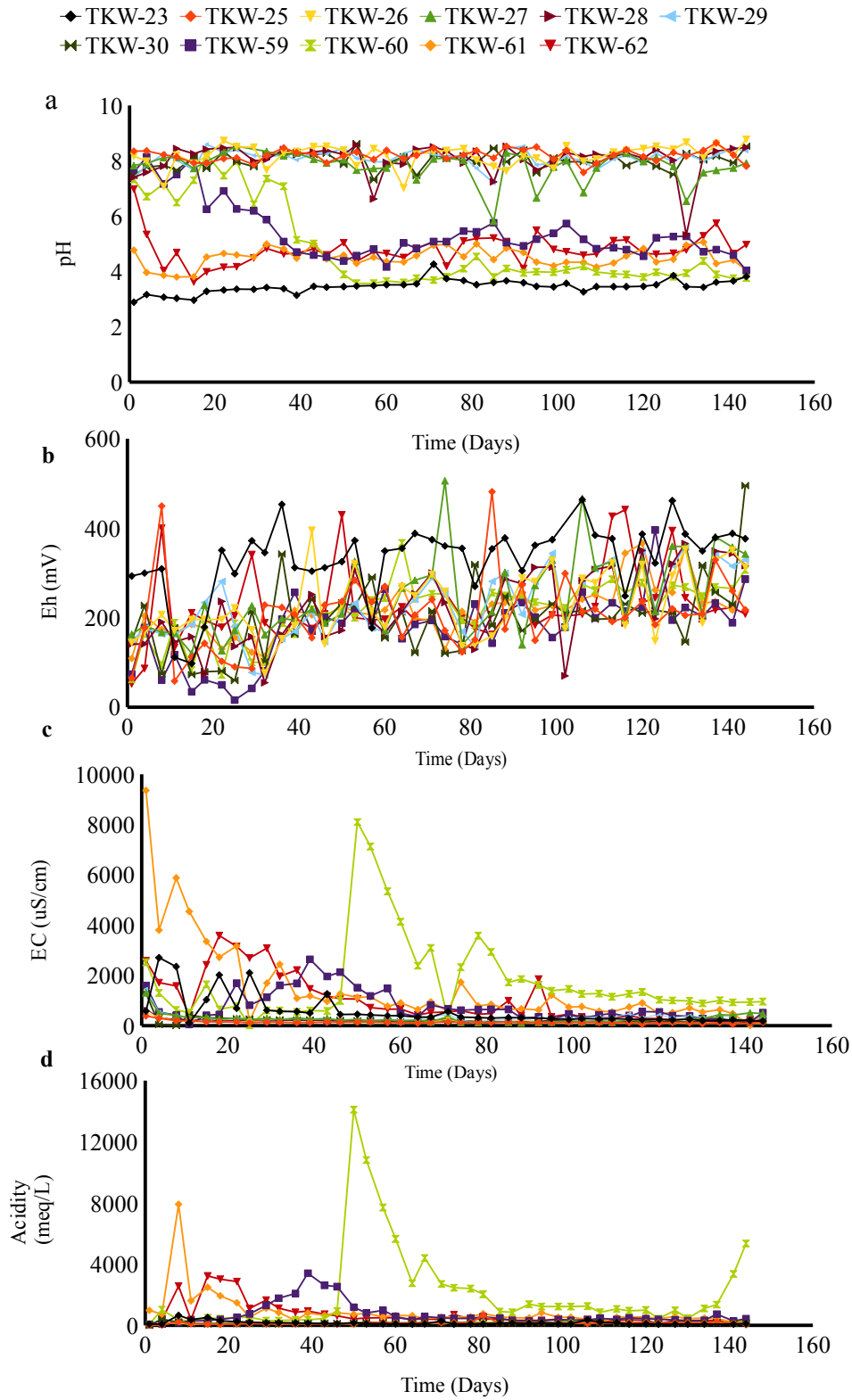

Figure 4.7 Evolution of pH, redox potential (Eh), conductivity (EC) from in weathering cell tests of waste rocks from oxide dump site

4.3.2.2 Specific results in waste rocks derived from waste rocks derived from transition dump

In dump site had 11 samples (Table 4.1) which were gossan, andesite, andesitic tuff, breccia limestone and massive sulfide. The results of these samples were selected as representatives (TKW-23, 26, 29 and 62) as below:

1) TKW-23

pH and redox potential variation

In TKW-23, gossan, the pHs were low (~2.89-4.26, average ~3.46), Eh values were wildly ranged from 97.40 to414.60 mV with average of ~335.22 mV., EC values were high (~2,700 µS/cm) and decreased during the experiment to reach low value of ~175.50 µS/cm (Figure 4.8a-b).

Acidity

The Acidity (Figure 4.8c) in this sample was not high. In the starting state of experiment, the acidity rapidly increased and tended to decrease after 20^{th} day. However, after half of the experiment, the concentration tended to increase again after approx. 60^{th}–80^{th} day. That evidence occurred in the same period, closely correlated with the increasing in SO_4^{2-} and acidity.

Arsenic

The As concentrations (Figure 4.8d) were low because the initial concentration was ~3.14 mg/L. However As concentrations slightly increased and reached ~0.331 mg/L. This evidence corresponded to levels of Eh because the solubility increases under oxidizing condition (Weiner, 2012)

Iron

The solubility of Fe (Figure 4.8e) increases under low Eh value (reducing condition) and low pH. During the earliest stage of experiment Fe concentrations were slightly increased (reached ~38.367 mg/L) because the condition was suitable for their solubility which low pH and Eh .

Calcium, magnesium and manganese

Concentrations of Mg (Figure 4.8g) were closely correlated to level of EC values. The EC values measured in the first and second cycles of the experiments were high, which conformed to Mg concentrations with having high concentration at the few cycles (reached ~43.457 mg/kg).

The low EC values measured in the leachate (reached 2700.00 μS/cm) were responsible for some cations, such as Mg (Figure 4.8g) which were high (reached 3.937 mg/L). Mn in the leachate was high (reached 35.638 mg/L). Amount of dissolved element such as Ca concentration (Figure 4.8f) was higher than those samples in the same dump site (ranged from 0.000 to 45.260 mg/L) and can reach 53.077 mg/L.

Copper, cobalt, lead and zinc

Co, Cu, Pb, Zn concentrations (Figure 4.8i-l) were released in low pH, the concentration of these elements were high which can reach, respectively, ~10.948, 193.568, 0.785, 6.721 mg/L. The concentration of these elements was high in the earliest cycles of experiment and decreased to low values at the end of the test. Because the elements may run out, there have no concentration of elements in the middle to the last stage of experiment.

Sulfates

The SO_4^{2-} concentration and EC values (Figure 4.8m) had similar trend. The concentrations of SO_4^{2-} were high in the earliest stage of the experiment and decreased during the experiment to approximately ~0.000-1.500 mg/L.

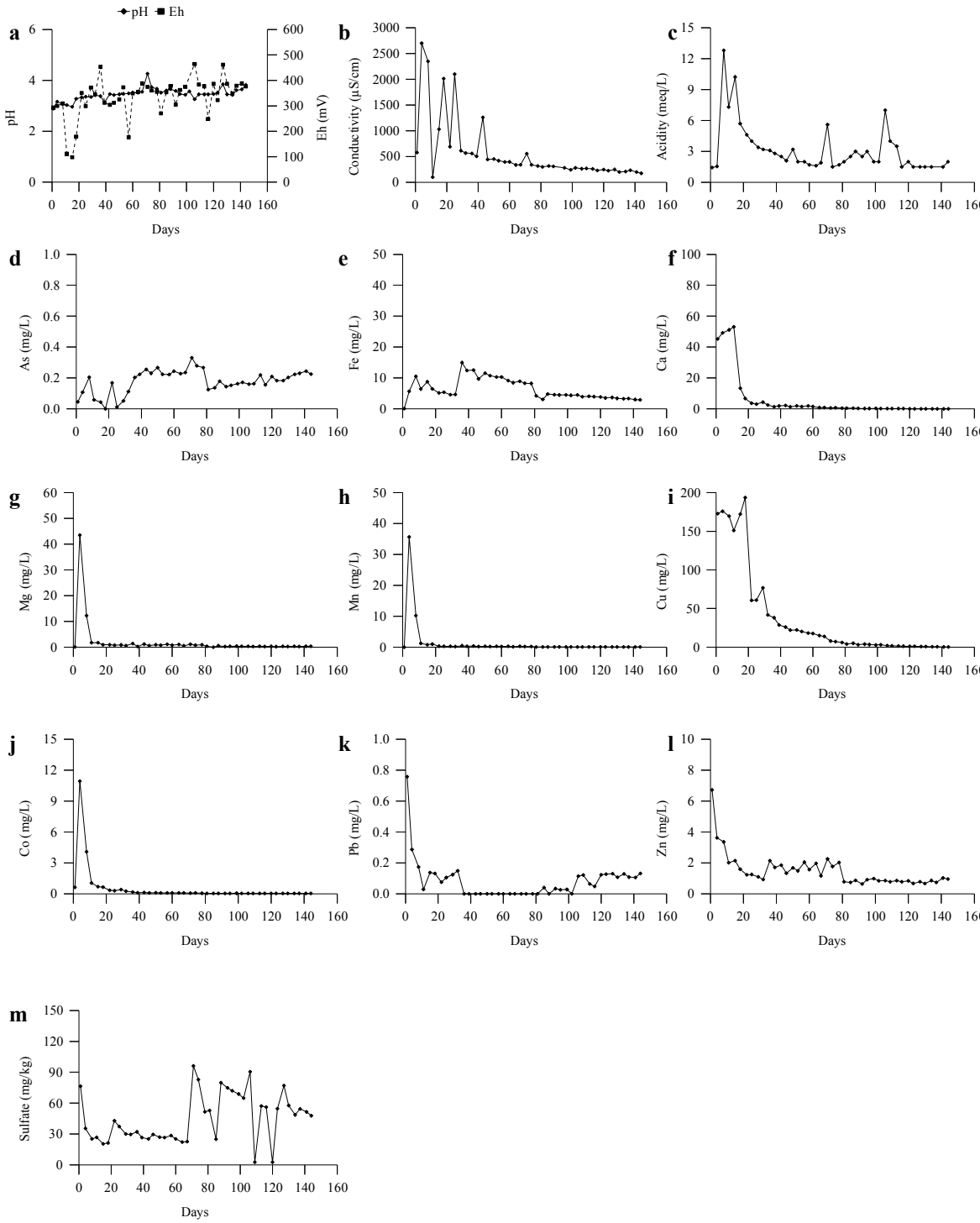

Figure 4.8 Water quality from the weathering cell tests on TKW-23 sample

2) TKW-26

pH and redox potential variation

TKW-26 (andesite) the pHs were high (pH~7-9). Eh values were not high and reached 395.2 mV, EC values were high in the first few cycle of experiment and reached 515.00 µS/cm and later decreased to low value approximately ~73.5 S/cm at the end of experiment (Figure 4.9a-b).

Acidity

The acidity values (Figure 4.9c) of this sample were not high, which were closely corresponded to pH level and the low concentrations of elements in leachate.

Arsenic

Because As increase under oxidizing condition, the solubility of element is low. Arsenic was low concentration and reached 0.149 mg/L (Figure 4.9d).

Iron

The concentration of Fe (Figure 4.9e) was low (8.696 mg/L). These elements increase their solubility with low pH and under the reducing condition

Calcium, magnesium and manganese

Because these Ca, Mg and Mn increase their solubility under low pH, reducing condition. As show in Figure 4.9g-h, pHs were high and the Eh values value tended to increase to oxidation condition (high value of Eh). The concentration of Ca, Mg and Mn (Figure 4.9f-h) not as high as TKW-23 (reached 17.953, 14.674 and 0.224 mg/L).

Copper, cobalt, lead and zinc

The Co, Cu, Pb, Zn can reach, respectively, 0.021, 0.0.044, 0.0.151, 0.0.448 mg/L because these elements were released in low pH; therefore, the concentration of these elements were low (Figure4.9i-l).

Sulfates

The SO_4^{2-}(Figure 4.9m) were responsible for EC levels. The low EC values measured in the leachate, in the same way as SO_4^{2-} which was not high (reached 88.579 mg/kg). In addition, sulfur content in the sample was only 0.05%, and SO_4^{2-} produced

by the oxidation of sulfides (Benzaazoua, 2004; Hakkou *et al.,* 2008).

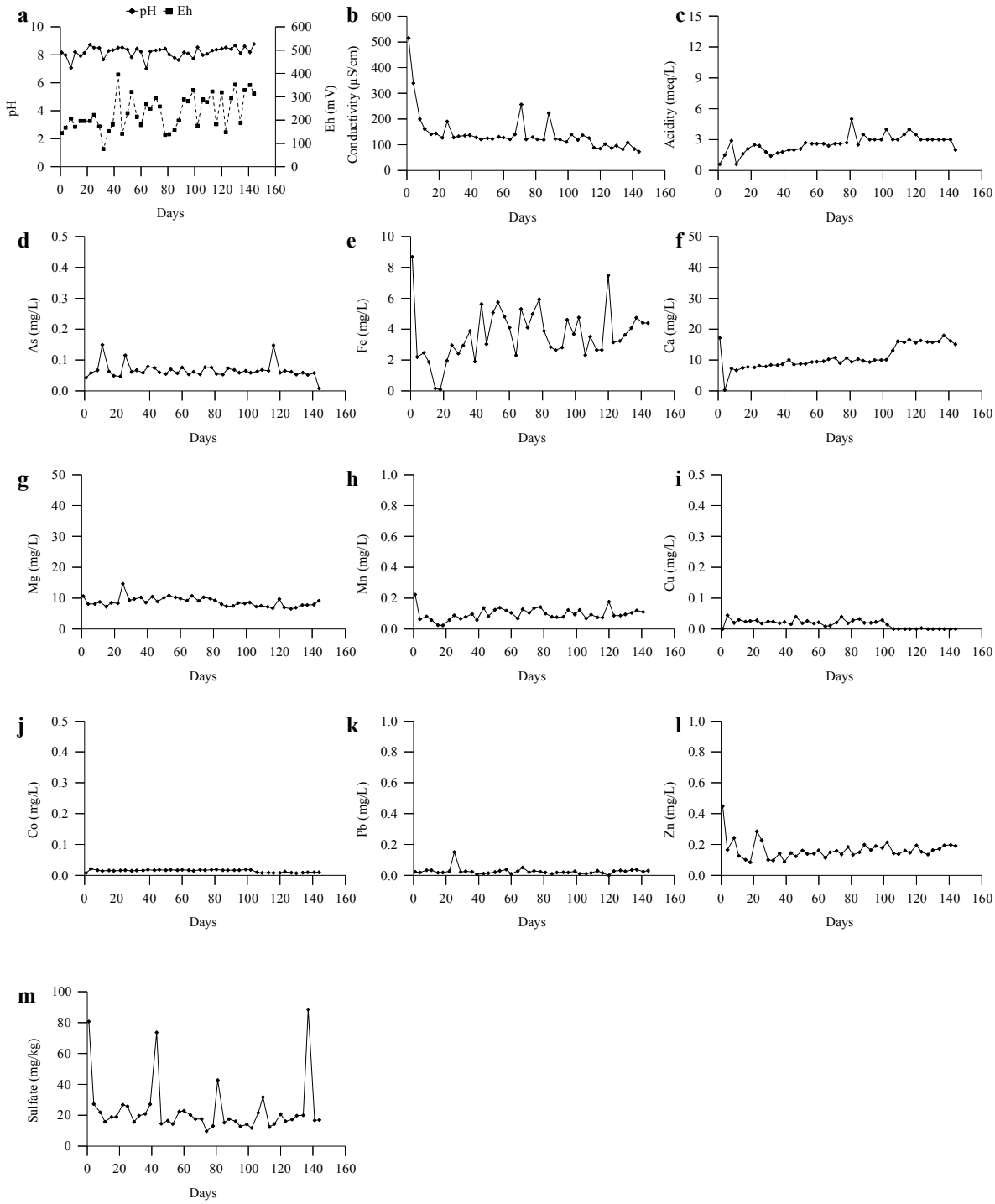

Figure 4.9 Water quality from the weathering cell tests on TKW-26 sample

3) TKW-25

TKW-25 is andesite as same as TKW-26; therefor, the geochemical behavior is same as TKW-26.

4) TKW-29

pH and redox potential variation

TKW-29, andesite, had high pH (pH~7-9), low Eh values (72.00-357.40 mV), starting the first few cycle with high EC values (1452.00 µS/cm) and decreased to low values (329.70 µS/cm) (Figure 4.10a-b).

Acidity

The acidity values (Figure 4.10c) of this sample were not high in the same way as pH and the low concentration of element in the leachate.

Arsenic

The solubility of As (Figure 4.10d) is responsible for high value of Eh, oxidizing condition. The concentrations of As were low (~reached 0.017 mg/L).

Iron

The concentrations of Fe (Figure 4.10e) were low (reached ~2.248 mg/L) because these elements increase their solubility with low pH and under reducing condition.

Calcium, magnesium and manganese

The concentrations of Ca, Mg and Mn (Figure 4.10f-h) were low (reached 18.322, 0.005 and 0.890 mg/L, respectively) because these elements increase their solubility under low pH and reduction condition.

Copper, cobalt, lead and zinc

The concentration of Cu (Figure 4.10i) also low (reached 2.248 mg/L) because these element increase their solubility with under low pH and reducing condition. As pH was high and the Eh value tended to increase to oxidation condition. The pHs of this sample were high; therefore, concentrations of Co, Pb and Zn (Figure 4.8j-l) in the leachate were low (reached 0.020, 0.067 and 0.433 mg/L, respectively).

Sulfates

The SO_4^{2-} concentrations (Figure 4.10m) were high (reached 638.884 mg/kg) and relate the Eh values and EC value which were increased during the experiment.

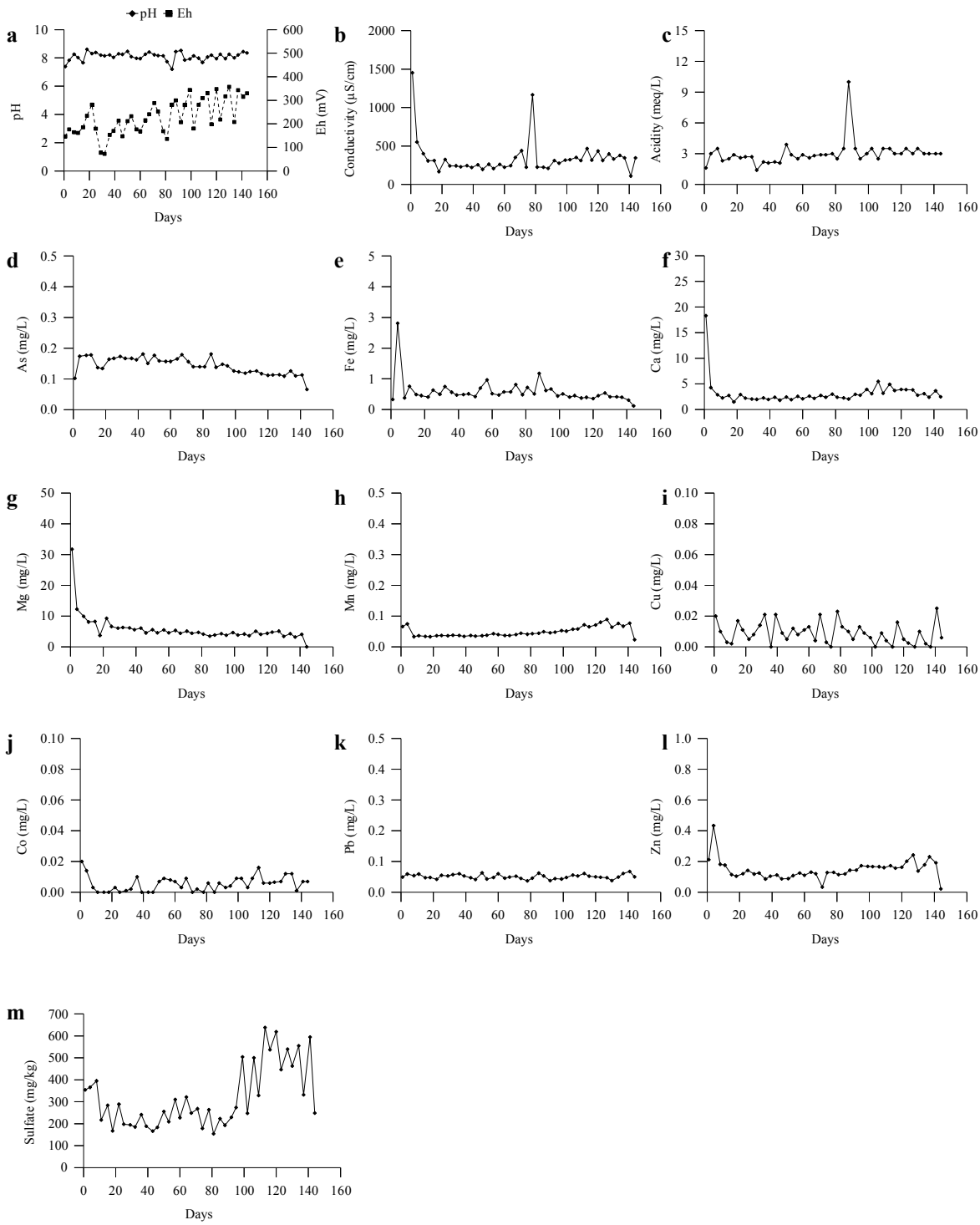

Figure 4.10 Water quality from the weathering cell tests on TKW-29 sample

5) TKW-27

TKW-27 is andesitic tuff and similar as TKW-29; therefore, the geochemical behavior is similar to those of TKW-29.

6) TKW-28

TKW-28 is andesitic tuff as same as TKW-29; therefore, the geochemical behavior is similar to those of TKW-29.

7) TKW-30

Even TKW-30 is breccia limestone, which is a different type of waste rock from TKW-29, the geochemistry can explain along to those of TKW-29.

8) TKW-62

pH and redox potential variation

The pH values of this sample were quite low (pH ~4-6), Eh values were wildly ranged (~52.20-441.40 mV) and EC values were high (reached 3,580.00 μS/cm) (Figure 4.9a-b). TKW-62 is a massive sulfide waste rock, and the specific gravity (G_s) reached ~3.82, indicating that this sample had a grater ratio of sulfide minerals than those of other waste rock types. As compared with other wastes rock types, the concentration of dissolve elements in this sample was very high.

Acidity

The acidity values (Figure 4.11c) were high in the first few cycles of experiment; however, after approximately day 40th of experiment when the pH slightly increased, the acidity tended to decrease.

Arsenic

Figure 4.11d shows the concentration sof As which were not high (reached~0.149 mg/L). The initial concentration of As in TKW-62 was low (~6.99 mg/L); therefore, there have no any element may ran out during the test.

Iron

For other elements such as Fe, the concentrations found in the effluent were very high. Figure 4.9e shows the concentration of Fe, the concentration was very high (reached ~4,156.70 mg/l). Because Fe solubility increases when pH value is low pH (reduction condition). The concentrations were the highest one in approximate 30^{th}-50^{th} day of experiment that the same period with in Figure 4.9a-b which pH and Eh values were low. The concentrations of Fe were high and decreased after it passed 60^{th} day because Fe in the sample was run out even the suitable condition; so, Fe was not released.

Copper, cobalt, lead and zinc

Even Co, Cu, Pb, Zn are released in low pH, the concentrations of these elements were not high (Figure 4.11i-l) which can reached, respectively, ~8.262, 193.568, 1.133, 17.369 mg/L during 20^{th}–40^{th} day of the experiment and decreased to low concentration at the end of the experiment. The evidence can be explained by the precipitate of metal sulfide.

Sulfates

Figure 4.11m shows the concentrations of SO_4^{2-} in the effluent which were high. The SO_4^{2-} concentration is affected on the solubility of trace element, such as Fe, Mg, Mn, Pb, Zn, Co, Cu and Ca, which can react with SO_4^{2-}, and precipitate as metal sulfides. The metal sulfide is insoluble; therefore, the concentration of soluble elements in effluent is decreased. The Mg is correlated to level of EC. The EC values before approximately day 60^{th} of the experiment were high, which conformed to Mg concentrations with having high concentration in the same period (reached ~70.20 mg/kg).

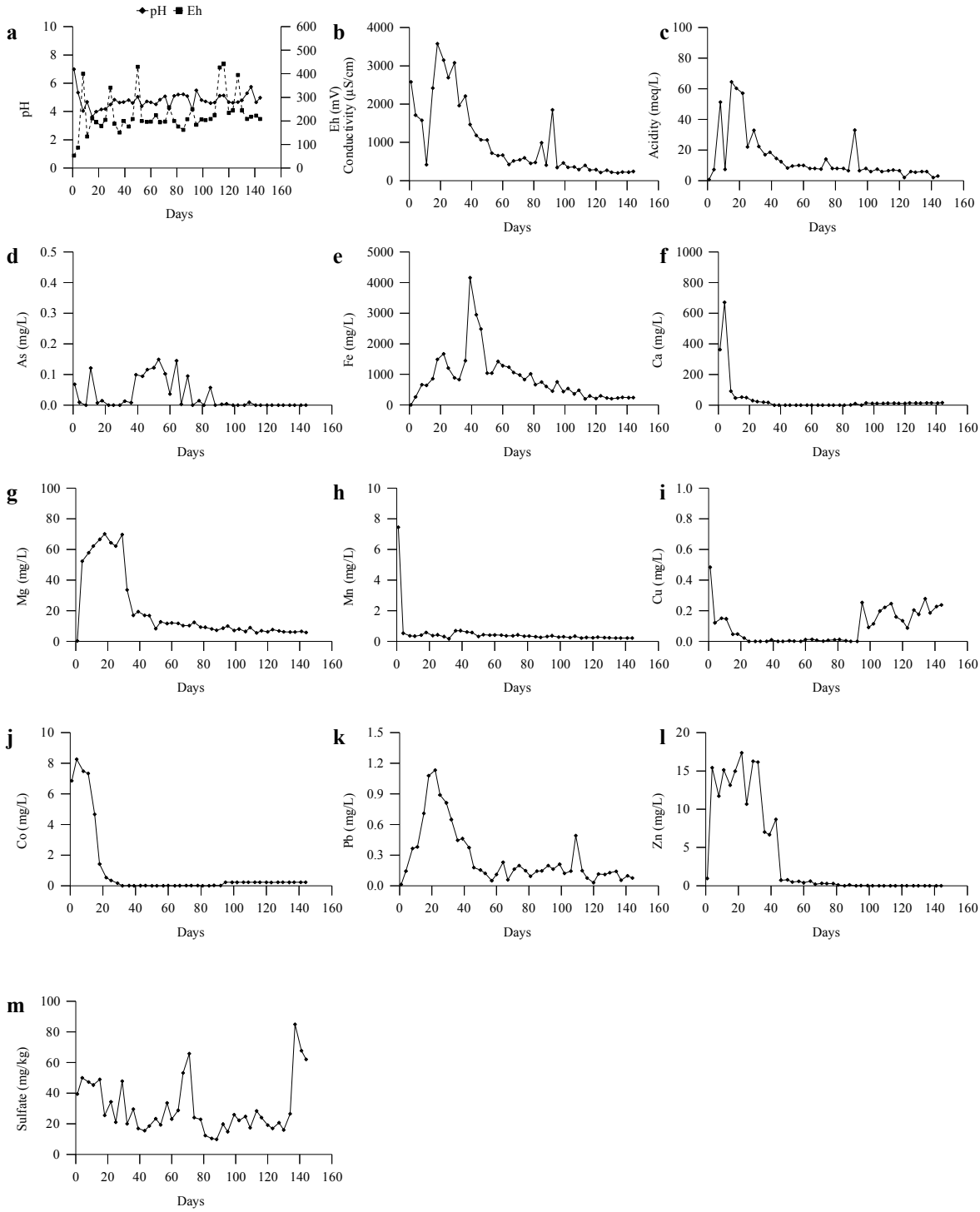

Figure 4.11 Water quality from the weathering cell tests on TKW-62 sample

9) TKW-59, TKW-60, TKW-61

TKW-59, TKW-60 andTKW-61were massive sulfide as similar to TKW-62; thereby, the geochemical behaviors can be explained in the similar way as explained in TKW-62.

4.3.3 Sulfide Dump

4.3.3.1 General Result in waste rocks derived from sulfide dump

Generally, pH of samples in this dump site wildly ranged from neutral to acidic conditions (pH ~4-9, Figure 4.12a). Eh values tended to increase during the weathering cell test (reached ~600 mV). EC values were high in the first few cycles and then decreased to lower values. As compared with in transition dump site, the acidity values in sulfide dump site were not high values.

As the water quality parameters in the first few cycle were unfavorable to sulfide oxidation; however, the pH values significantly decreased in the later. At same period of decreasing pH, the Eh values obviously decreased. This condition was desirable for sulfide oxidation (Benzaazoua *et al.,* 2003). The EC values in the last few cycles of experiment tend to increase, and can be explained by the increasing in mineral dissolution in the leaching which increased by an effect of changing in pH and Eh values (Benzaazoua *et al.,* 2003). Acidity values measured in the leaching were high about the same period as pH and Eh values changes because the maintaining pH at neutral values used up a carbonate minerals to consume the sulfide oxidation product (Benzaazoua *et al.,* 2003). After carbonate mineral was used up, the acidity then increased. The element measured from the effluent in sulfide dump site increased in the same time as the acidity increased because the solubility increases as low pH condition..

Therefore, the assumption from the AMD generation potential in this dump site was that the acidity will not get high in the earliest stage. However, after the time pass and the carbonate used up for neutralize acid produced from sulfide oxidation, acidity will increase. As the acidity increases and pH of leachate was acidic low , the heavy metal will continuously increase their solubility and release to the environment.

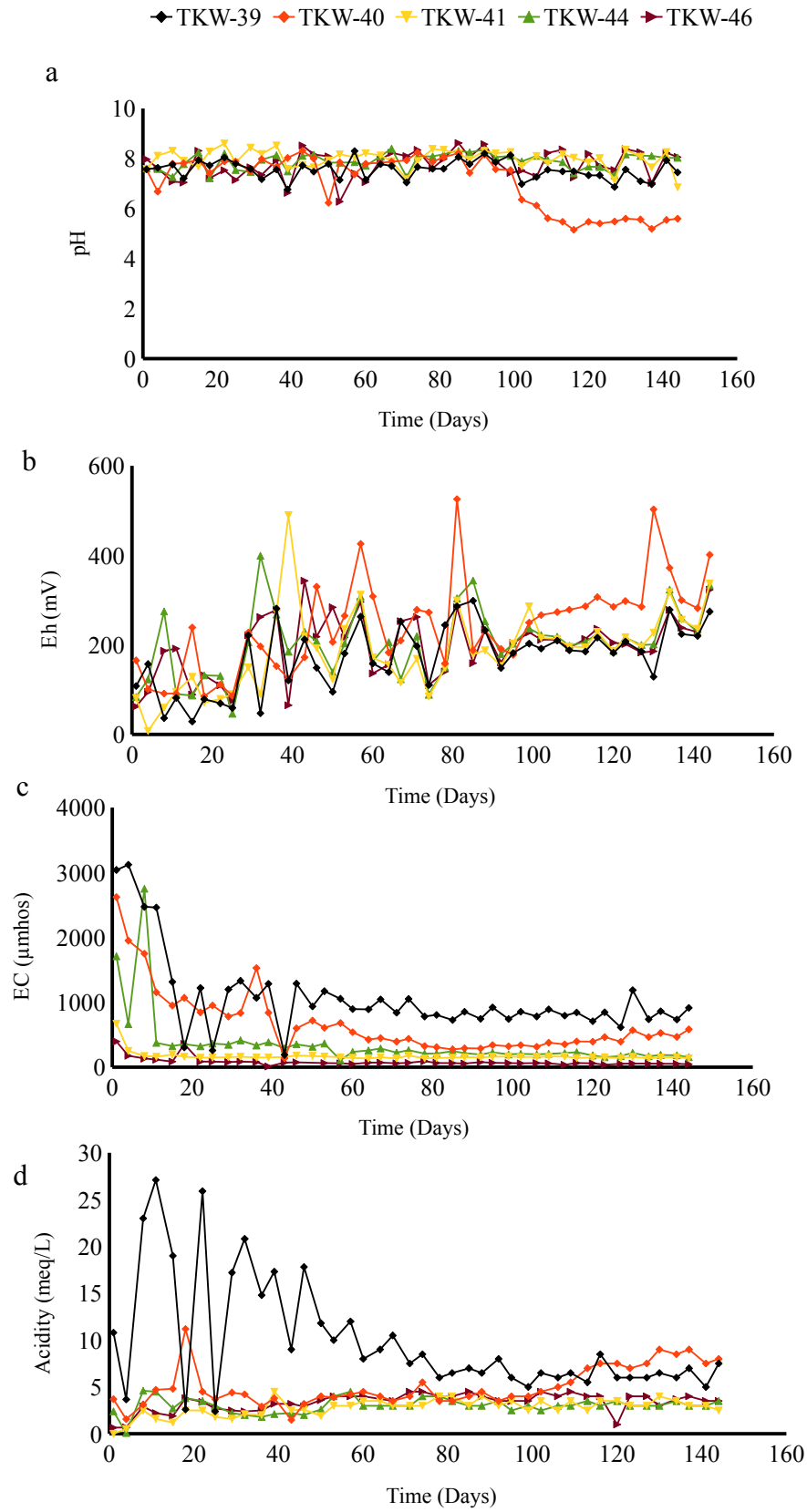

Figure 4.12 Evolution of pH, redox potential (Eh), conductivity (EC) from in weathering cell tests of waste rocks from sulfide dump site

4.3.3.2 Specific Result in waste rocks derived from transition dump

Sulfide dump site had five samples (Table 4.1) which were massive sulfide: skarn, andesitic tuff and mudstone. The results of these samples were selected as representatives (TKW-39 and 40) as below:

1) TKW-39

pH and redox potential variation

This sample was a massive sulfide sample which very high sulfide mineral ratio (4.32) as indicate by the specific gravity (G_s). Even though this sample is the same type of waste rock as TKW-59, TKW-60, TKW-61, TKW-62, the geochemical behaviors were different. Compared with the same type of waste rock, pH values of this sample were quite high (pH~7-9). Redox potential values (Eh) were quite low (28.90-298.90 mV) and acidity valued were low (reached 27.10 meq/L, Figure 4.13a). EC values were high (reached 3,120 µS/cm, Figure 4.13b) in the few first cycles and rapidly decreased during the weathering cell tests.

Acidity

In the few first cycles of experiment, the acidity values (Figure 4.10c) were high (reached ~27.10 meq/L) then the acidity slightly decreased and remained at approximately ~6-7 meq/L. The acidity was not high and had a good correlation with level of pH and Eh value. The slightly increasing of only Eh values cannot affect on the solubility of element. As shown in Figure 4.13a, the pH values were high and not wildly changed during the experiment.

Arsenic

Since the condition was unfavorable to As solubility, the As concentrations (Figure 4.13d) thus were not high (reached ~0.580 mg/L). In addition, the concentrations were decreased to very low concentration after a few first cycle of experiment

Iron

The initial concentration of Fe (Figure 4.13e) was high (~631,670 mg/L); nonetheless, the concentrations of Fe on the effluent obtained from the leaching test were very low (reached ~8.40 mg/L). Because the solubility of Fe increases when the value of pH and Eh values are low, the effluent thus had low concentration of Fe.

Calcium, magnesium and manganese

Concentrations of Ca, Mg and Mn (Figure 4.13f-h) in the first few cycle were high, respectively, reached ~47.510, 1,270,870 and 10.173 mg/L as the same period of the high acidity values. When the high concentration was produced, the carbonate mineral released at the high concentration to neutralize the acidity. However after approximately 40^{th}-70^{th} day of experiment, the acidity was then decreased. Therefore, the concentration of all these carbonate minerals were decreased their concentration of mineral released to neutralization as well.

Copper, cobalt, lead and zinc

As similar to behaviors of Fe, concentrations of other metals were low at the high pH values (Figure 4.13i-l).The concentration of these elements (Co, Cu, Pb, Zn) were not high and can reach, respectively, ~0.128, 0.661, 0.189, 4.238 mg/L.

Sulfates

Because SO_4^{2-} (Figure 4.13m) is produced by the oxidation reaction, there was a good correlated to Eh values. Sulfate concentrations were not high and reached 97.823 mg/kg.

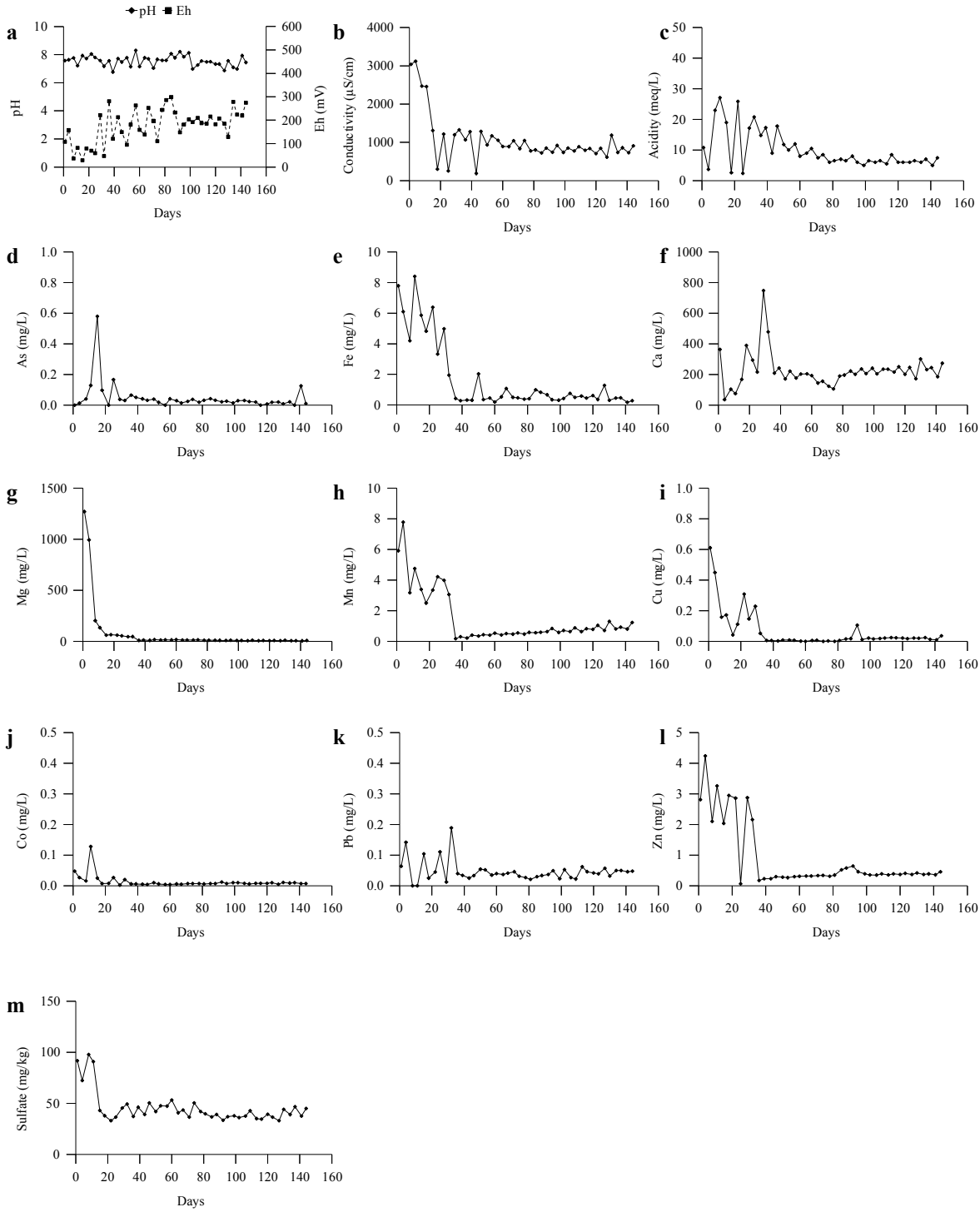

Figure 4.13 Water quality from the weathering cell tests on TKW-39 sample

2) TKW-40

pH and redox potential variation

The TKW-40, skarn, was ranged from slightly acidic to slightly alkaline (pH ~5-8). After approximately 100th day of experiment, the pH rapidly decreased (to approximately 5.0-5.5), which closely correlated to Eh value, which tended to increase at the same period. The EC value was quite high in the starting and slightly decreased to lower values at the end of the experiment (ranged from 2,520.00 to 581.00 μS/cm) (Figure 4.14a-b).

Acidity

The acidity after 100th day of experiment was significantly increased. This is the clearly evidence to explain the solubility of the element in low pH. In that period of time, the pH dropped to approximately ~5-6, the SO_4^{2-} concentration slightly increased; therefore, the acidity increased (Figure 4.11c). The elements such as Cu (Figure 4.14i), Co (Figure 4.14j) and Zn (Figure 4.14l) showed the concentration of elements which significantly increased at the time as the acidity values were high.

Arsenic

Even in the latest stage of experiment the condition favorable for the solubility, the element concentration of As (Figure 4.14d) was still low because the initial concentration was low (7.60 mg/L) and it may ran out during the experiment.

Iron

Fe concentrations (Figure 4.14e) in this sample was low and not tend to increase during the experiment.

Calcium, magnesium and manganese

Figure 4.14f-g showed graph of Ca and Mg, which were represent carbonate dissolution product, in the earliest of experiment these two elements was high (Ca reached ~821.638 mg/L, Mg reached ~129.123 mg/L) and decreased to very low concentration. This evidence occurred in the same period of decreasing of pH levels. After approximately 100th day, the results revealed that Ca and Mg was run out, the pH decreased and Eh values increased; consequently, Manganese (Mn) increased their

solubility and was released higher in leachate. Figure 4.14h Mn increased their solubility after 100th day of experiment (reached ~8.055 mg/L). This evidence occurred after the carbonate dissolution product used to neutralize was run out;thus, the pH was rapidly decreased and the solubility of metals increased .

Copper, cobalt, lead and zinc

The element concentration of Pb (Figure 4.14h) was low because the initial concentration was low (13.50 mg/L). Zinc, Co, Cu (Figure 4.11l,j,i) were increased their solubility after 100th day of experiment (reached ~20.349, 0.083, 114.423 mg/L, respectively). This evidence occurred after the carbonate dissolution product used to neutralize was run out;thus, the pH was rapidly decrease and solubility of Pb increase.

Sulfates

The SO_4^{2-} concentration (Figure 4.14m) was high and not wildly ranged during the weathering cell test because it released since the experiment started. However, the effluent obtained from the experiment was not acidic due to neutralization of carbonate dissolution products in the sample.

3) TKW-41

The TKW-41 was the same waste rock type as TKW-40; therefore, the geochemical behavior may be the same. As compared with TKW-40, pH, Eh values , EC values and acidity of TKW-41 were similar behaviors. However, from the Figure 4.12a-b the results found that the Eh values and acidity tended to increase as well as pH tended to decrease during the experiment. As the pH values were quite high, the solubilities of elements were low. This evidence was similar to TKW-40; nevertheless, after carbonate dissolution (such as Ca and Mg) were run out, pH of the effluent obtained from waste rock sample dropped and became acidic solution.

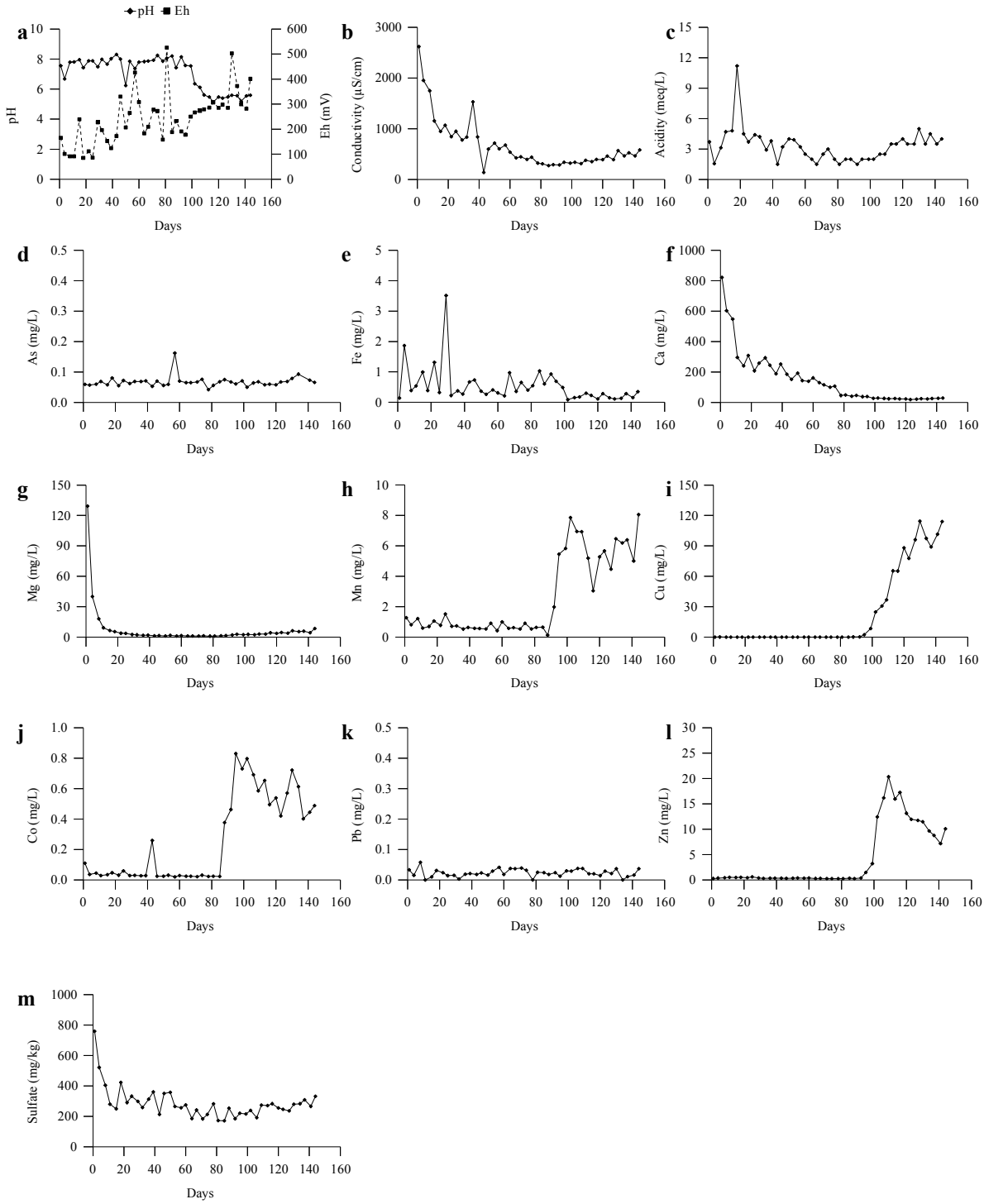

Figure 4.14 Water quality from the weathering cell tests on TKW-40 sample

4) TKW-44

The TKW-44 was andesitic tuff. The results found that high level of pH , low Eh values, low EC values, low acidity and low solubilities of trace elements. Even this sample found in sulfide dump site, the geochemical behavior was similar as samples collected from transition zones: TKW-27, TKW-28 and TKW-29, that were the same type of waste rocks as TKW-44.

The initial concentrations of Ca, Mg and Mn were high ,respectively, ~ 13,764.30, 4,559.90 and 1,140 mg/L); therefore, this sample may able to neutralize SO_4^{2-} that produced by sulfide oxidation reaction.

5) TKW-46

The TKW-46 was mudstone. The results found that high level of pH, low Eh values, low EC values and low acidity. However, the pH tended to decrease which closely correlated to the Eh values, tended to increase during the experiment. If the experiment was longer than 144 days, these samples may generate acid as explained such behaviors in TKW-41.

4.4 Oxidation-neutralization curve

Kinetic test can assess the generation potential in long term by using the kinetic test results (Benzaazoua *et al.,* 2004; Plant *et al.*, 2010; vileneuve *et al.,* 2003; vileneuve *et al.,* 2004). Cumulative sulfate (SO_4^{2-}) concentration, which was the representation of oxidation product, was plotted versus summation of Ca+Mg+Mn concentration, which was the representation of carbonate dissolution product. The unit of cumulative concentration of SO_4^{2-} and Ca+Mg+Mn were converted to milligram per kilogram (mg/kg) of waste rock samples. The obtained curve was so-called “Oxidation - Neutralization curve”, which based on hypotheses that the curve stays linear and the oxidation and neutralization products stay linear, indicating that mineral releases may not finally cause AMD in long-term periods (Hakkou *et al.*, 2009; Benzaazoua *et a.l,* 2001; Benzaazoua *et al.,* 2004; Plant *et al.,* 2010).

The weathering cell test results gave curves as shown in Figure 4.14a-y; in addition, a correlation coefficient (r) were shown in Table 4.3. The correlation coefficient (r) indicated the linear shape ($r > 0.98$) of oxidation-neutralization curve

(Table 4.3).

The oxidation – neutralization curve can be used to assess and predict the waste rocks geochemical behavior. The AMD generation potential can predict the long term acid generation by extrapolating the oxidation–neutralization curve and by projecting the initial content of sulfate (converted from sulfur content) and Ca, Mg and Mn concentrations of the tailings (Benzaazoua *et al.,* 2004).

Table 4.3 Oxidation-neutralization slope values

Location	Rock type	Sample Name	R^2	r
Oxide Dump	Limestone	TKW-2	0.9704	0.9851
		TKW-6	0.9808	0.9903
	Andesite	TKW-8	0.9866	0.9933
		TKW-11	0.9455	0.9724
	Siltstone	TKW-14	0.9930	0.9965
		TKW-15	0.9016	0.9495
	Mudstone	TKW-18	0.9754	0.9876
		TKW-19	0.9771	0.9885
	Gossan	TKW-22	0.9701	0.9849
Transition Dump	Gossan	TKW-23	0.3427	0.5854
	Andesite	TKW-25	0.9442	0.9717
		TKW-26	0.9893	0.9947
	Andesitic tuff	TKW-27	0.9626	0.9811
		TKW-28	0.9904	0.9952
		TKW-29	0.9625	0.9811
	Breccia limestone	TKW-30	0.9802	0.9901
	Massive sulfide	TKW-59	0.8131	0.9017
		TKW-60	0.8907	0.9438
		TKW-61	0.6015	0.7756
		TKW-62	0.9657	0.9827
Sulfide Dump	Massive sulfide	TKW-39	0.9885	0.9942
	Skarn	TKW-40	0.8842	0.9403
		TKW-41	0.9992	0.9996
	Andesitic tuff	TKW-44	0.9760	0.9879
	Mudstone	TKW-46	0.9929	0.9965

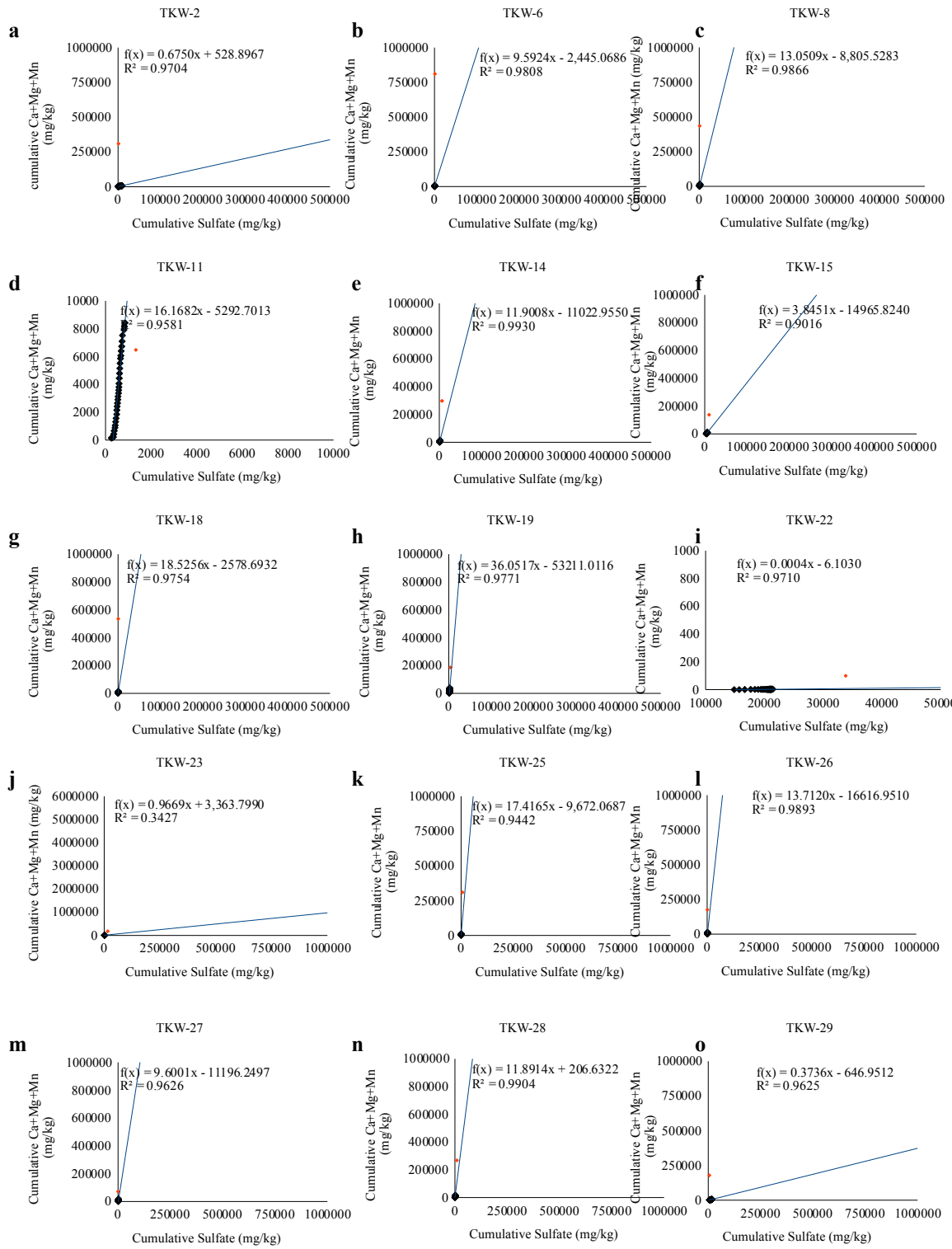

Figure 4.15 Oxidation-neutralization curves corresponding to weathering cell tests on the waste rock in gold mine, Thailand

*orange point plotted between initial sulfate and Ca+Mg+Mn concentration

**black point plotted between cumulative concentration of SO_4^{2-} and Ca+Mg+Mn from weathering cell test

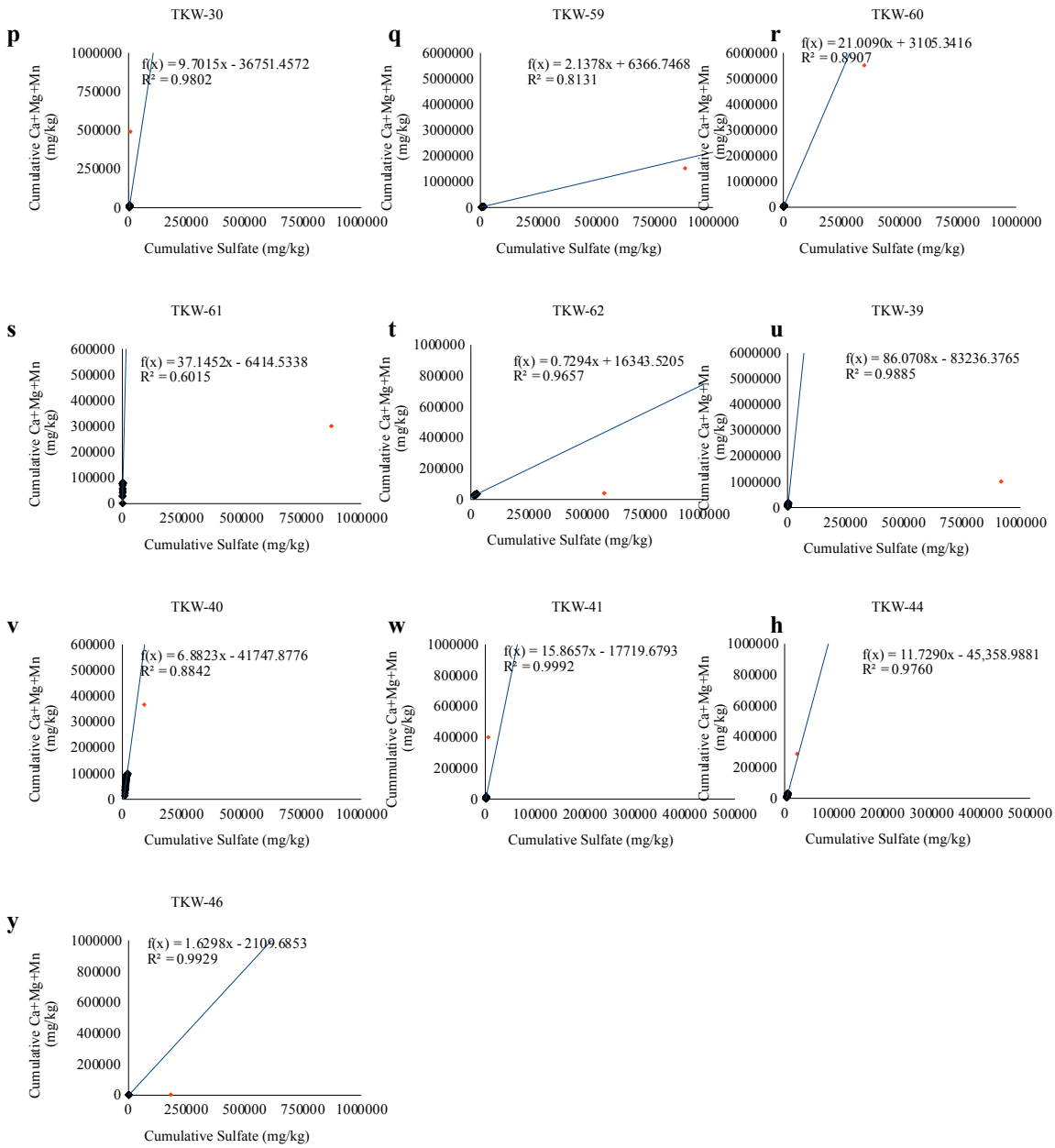

Figure 4.15 (continue) Oxidation-neutralization curves corresponding to weathering cell tests on the waste rock in gold mine, Thailand

*orange point plotted between initial sulfate and Ca+Mg+Mn concentration

**black point plotted between cumulative concentration of SO_4^{2-} and Ca+Mg+Mn from weathering cell test

The oxidation-neutralization curves showed the AMD generation potential in each sample. Samples potentially generated acid in long-term were TKW-11 (andesite, oxide dump), TKW-59 (massive sulfide, transition dump), TKW-60 (massive sulfide, transition dump), TKW-61(massive sulfide, transition dump), TKW-62 (massive sulfide, transition dump), TKW-39 (massive sulfide, sulfide dump), TKW-40 (skarn, sulfide dump), TKW-46 (mudstone, sulfide dump).

Results from the weathering cell test were compared with the results from static test in Table 4.4 almost samples gave similar results. The advantages of the kinetic test can define the AMD generation potential of waste rock samples defined in the uncertainty zone from static tests.

Table 4.4 Comparison between result from the static test* and weathering cell test

Location	Sample no.	Rock type	Static test	weathering cell test
Oxide Dump	TKW-2	Limestone	NAF	NAF
	TKW-6	Limestone	NAF	NAF
	TKW-8	Andesite	UC	NAF
	TKW-11	Andesite	NAF	PAF
	TKW-14	Siltstone	UC	NAF
	TKW-15	Siltstone	UC	NAF
	TKW-18	Mudstone	NAF	NAF
	TKW-19	Mudstone	NAF	NAF
	TKW-22	Gossan	PAF	NAF
Transition Dump	TKW-23	Gossan	UC	NAF
	TKW-25	Andesite	NAF	NAF
	TKW-26	Andesite	NAF	NAF
	TKW-27	Andesitic tuff	UC	NAF
	TKW-28	Andesitic tuff	NAF	NAF
	TKW-29	Andesitic tuff	NAF	NAF
	TKW-30	Breccia limestone	NAF	NAF
	TKW-59	Massive sulfide	PAF	PAF
	TKW-60	Massive sulfide	PAF	PAF
	TKW-61	Massive sulfide	PAF	PAF
	TKW-62	Massive sulfide	PAF	PAF
Sulfide Dump	TKW-39	Massive sulfide	-	PAF
	TKW-40	Skarn	PAF	PAF
	TKW-41	Skarn	NAF	NAF
	TKW-44	Andesitic tuff	UC	NAF
	TKW-46	Mudstone	UC	PAF

*static test results obtained from Changul (personal communication)

Both results from static and kinetic tests were used to determine the AMD generation potential. The static test indicated the ability of sample to generate and neutralize acid. There have many types of static test such as Net Acid Producing Potential (NAPP) and Acid/Base Account (ABA), as used in the Environmental Research Institute, 2555. However, results from static test cannot define the ability to generate acid in some samples, as indicated in 'uncertainty zone'. The kinetic test conducted to confirm the static test results and further estimate rate of acid generation by measuring sulfide oxidation product. Table 4.4 showed the comparison between results from the static test and the weathering cell test. In almost results were similar to the results from the static test measured by Environmental Research Institute, 2555 except for sample TKW-11(andesite, oxide dump) and TKW-22 (gossan, oxide dump). The previous study by Ferguson and Morin (1991) found the different between the results from static and kinetic test. This evidence can determine the AMD generation potential by using the oxidation rate and other factors from existing data, then predict the most possible way that sample can react (Ferguson and Morin, 1991, US. EPA, 1994).

Data obtained from the weathering cell tests of TKW-11 showed that the pH this sample was neutral to alkalinity (pH ~ 7-9) and low EC values (ranged from 18.80 to 269.00 µS/cm). Eh values were low in the initial stage and slightly increased (57.38 to 483.20 mV). This condition may resemble as non acid production potential. Even the geochemical parameters indicated the non acid generation potential, the results from the weathering cell test indicated this sample has potentially generated acid mine drainage for long periods. The weathering cell tests predicted the AMD generation potential by plotting the initial sulfate and Ca+Mg+Mn concentration of waste rock, compared with oxidation-neutralization curve. Figure 14.1d showed the point was underneath the oxidation-neutralization curve (R^2 = 0.9581); therefore, TKW-11 were Figured out as acid generating sample. The sulfate oxidation rate of TKW-11 was 34.28 mg SO_4^{2-}/kg/week which was not high compared with other samples; however, the initial concentrations of Ca, Mg, Mn was low (402.30, 209 and 28.80 mg/kg, respectively). Moreover, during the weathering cell test, the concentration of Ca, Mg, Mn measured in the effluent tended to be lower and reach approximately 15.745, 20.609, 0.526, respectively. For this reason even the sulfur content was low, the sample can generate acid for long-term period because the low concentrations of Ca, Mg and

Mn, which may not capable of neutralizing release of sulfate produced from the oxidation reaction.

For TKW-22 samples, which static test indicated that sample potentially generate acid drainage while the weathering cell tests Figured out this sample was a non acid generating sample. The TKW-22 had neutral to alkalinity pH (pH~ 6-9) and pH tended to increase during the weathering test. EC value at the initial stage was high with the maximum EC of 3,020.00 µS/cm and tended to decrease during the test (reach to 54.70 µS/cm at the end of experiment). Eh values were wildly ranged and not high (maximum ~ 514.30 mV and average ~ 245.38 mV). This condition seems to be defined as non acid generating formation. Figure 14.4i showed the results of AMD prediction on sample TKW-22 by the oxidation-neutralization curve (R^2 = 0.9710), considered as non acid generation. The initial concentration of Ca, Mg and Mn were 6,511, 198.60 and 6.40 mg/L, respectively which was higher as compared with other samples. The sulfur content of this sample was 1.27 which seemed to be higher than other samples. However, results from the weathering cell test showed that the neutralization product (Ca+Mg+Mn) can neutralize the sulfate from oxidation reaction in long-term periods.

In addition, another aim of this project is to determine rate of acid mine generation from waste rock by measure the cumulative SO_4^{2-} release per time. Because the oxidation reaction produced SO_4^{2-} as a main product, the cumulative SO_4^{2-} concentration were plotted versus time to find oxidation rate (Figure 14.16).

Figure 14.16 Evolution of cumulative SO_4^{2-} load obtained from water chemistry corresponding to weathering cell tests.

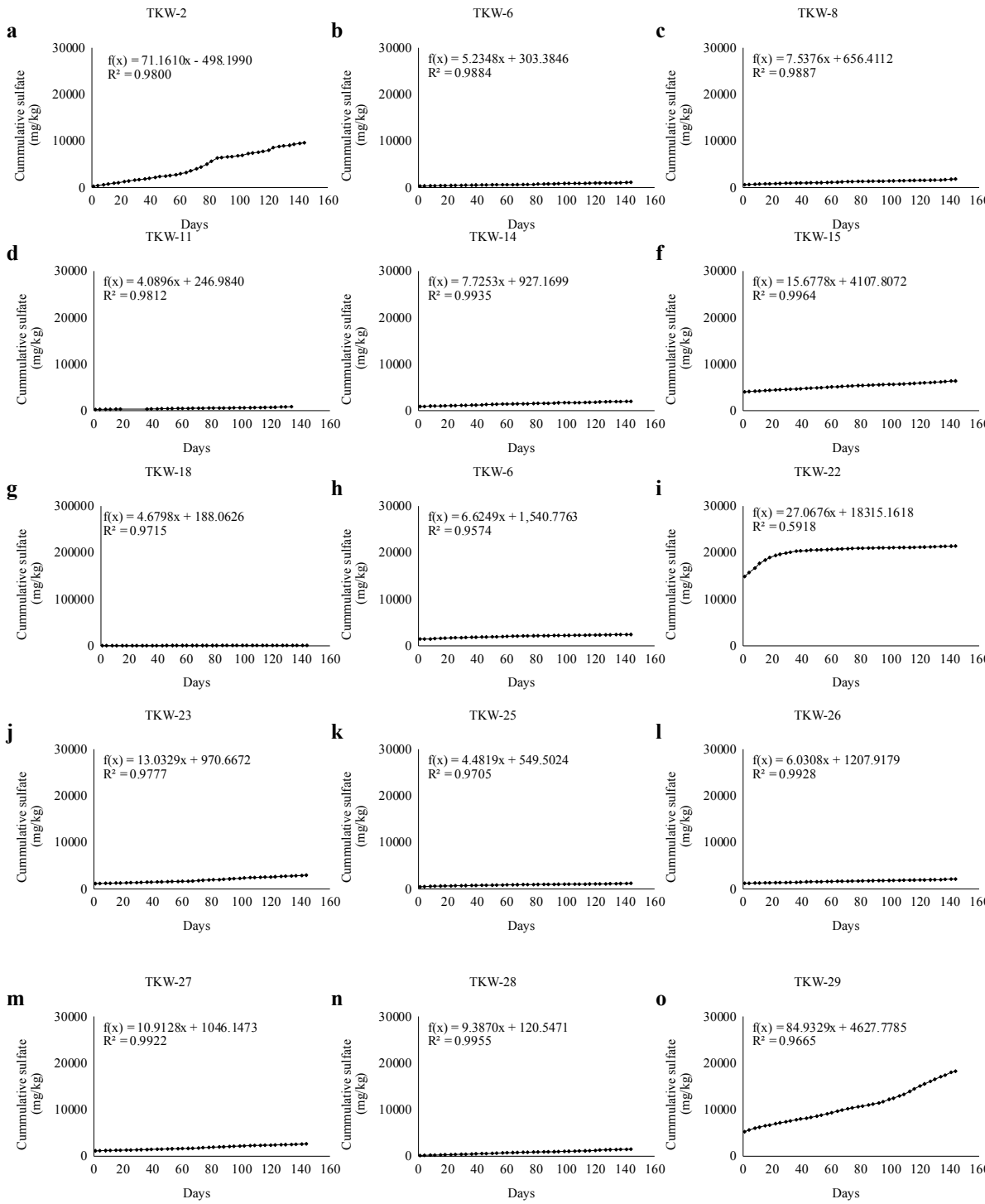

Figure 4.16 Evolution of cumulative SO_4^{2-} load obtained from water chemistry corresponding to weathering cell tests

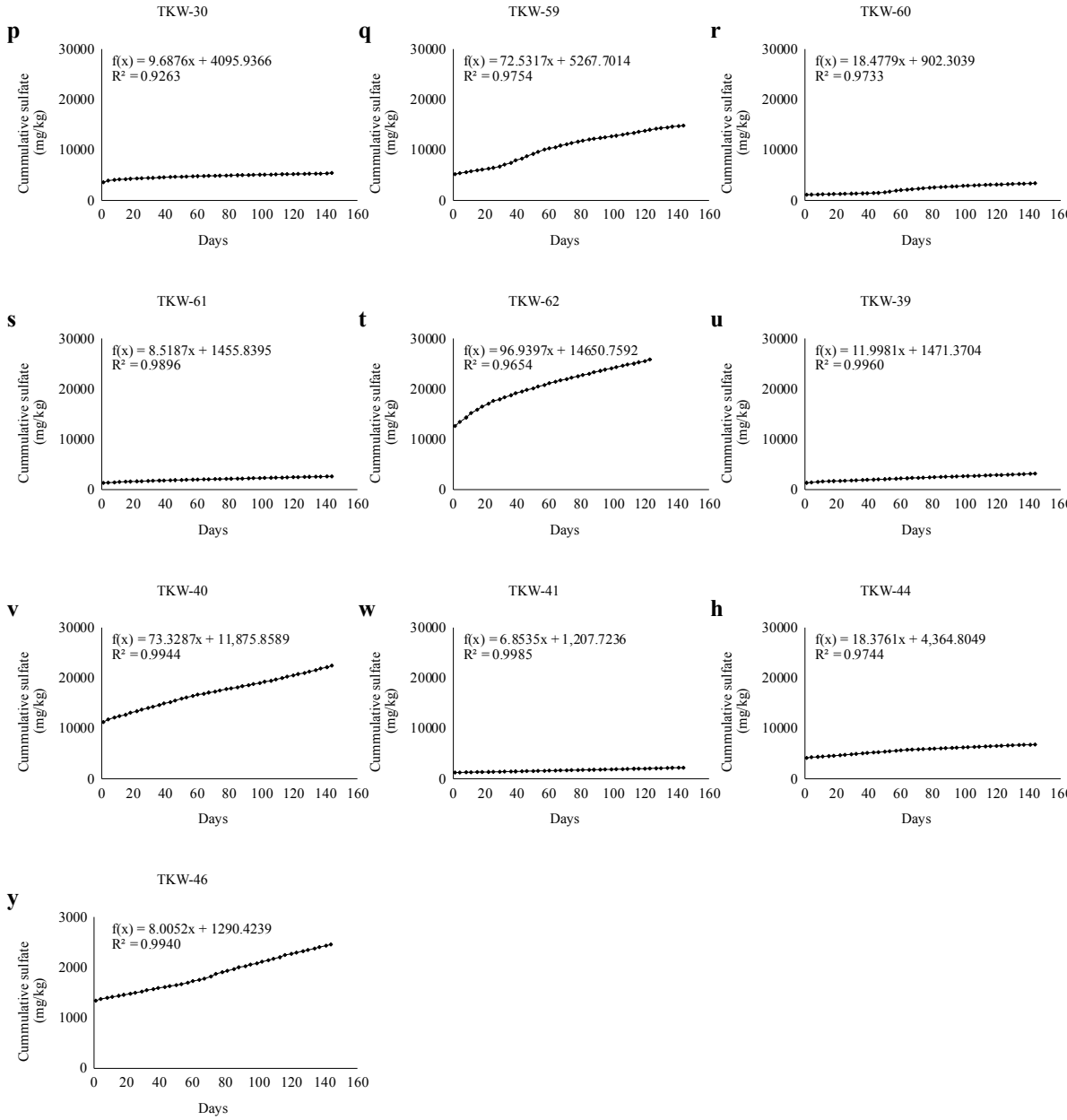

Figure 4.16 (continue) Evolution of cumulative SO_4^{2-} load obtained from water chemistry corresponding to weathering cell tests

The oxidation rate which obtained from the above graph were show in the Table 4.5. The oxidation rate in transition and sulfide dump were quite high. In oxide dump site, siltstone samples (TKW-14 and TKW-15) were significantly produce SO_4^{2-} compare withe other sample. The TKW-14 and TKW-15 release SO_4^{2-} 155.87 and 166.30 mg/kg/week, respectively. In transition dump site, massive sulfide waste rock (TKW-62) had the highest SO_4^{2-} concentration (815.67 mg/kg/week) and in sulfide dump site SO_4^{2-} concentration was maximum at 540.01 mg/kg/week. This evidence means the AMD generation potential in these two dump sites higher than in oxide

dump site; therefore, these two dump site should have a plan to treat the AMD problem.

Table 4.5 Rate of sulfate produced from the oxidation reaction.

Location	Sample no.	Rock type	Cumulative sulfate (mg/kg/year)	Mean oxidation (mg/kg/day)	Oxidation rate (mg/kg/week)
Oxide Dump	TKW-2	Limestone	25,475.57	69.80	488.57
	TKW-6	Limestone	2,214.09	6.07	42.49
	TKW-8	Andesite	3,407.64	9.34	65.35
	TKW-11	Andesite	1,739.69	4.77	33.39
	TKW-14	Siltstone	3,746.90	10.27	71.86
	TKW-15	Siltstone	9,830.20	26.93	188.52
	TKW-18	Mudstone	1,896.19	5.20	36.37
	TKW-19	Mudstone	3,958.87	10.85	75.92
	TKW-22	Gossan	28,194.84	77.25	540.72
Transition Dump	TKW-23	Gossan	5,727.68	15.69	109.85
	TKW-25	Andesite	2,185.40	5.99	41.91
	TKW-26	Andesite	3,409.16	9.34	65.38
	TKW-27	Andesitic tuff	5,029.32	13.78	96.45
	TKW-28	Andesitic tuff	3,546.80	9.72	68.02
	TKW-29	Andesitic tuff	35,628.29	97.61	683.28
	TKW-30	Breccia limestone	7,631.91	20.91	146.37
	TKW-59	Massive sulfide	31,741.77	86.96	608.75
	TKW-60	Massive sulfide	7,646.74	20.95	146.65
	TKW-61	Massive sulfide	4,565.17	12.51	87.55
	TKW-62	Massive sulfide	50,033.75	137.08	959.55

Location	Sample no.	Rock type	Cumulative sulfate (mg/kg/year)	Mean oxidation (mg/kg/day)	Oxidation rate (mg/kg/week)
Sulfide Dump	TKW-39	Massive sulfide	5,850.68	16.03	112.20
	TKW-40	Skarn	38,640.83	105.87	741.06
	TKW-41	Skarn	3,709.25	10.16	71.14
	TKW-44	Andesitic tuff	11,072.08	30.33	212.34
	TKW-46	Mudstone	4,212.32	11.54	80.78

Rate of sulfate produced from the oxidation reaction indicate that massive sulfide waste rock released very high concentration of SO_4^{2-}. Massie sulfide waste rock samples in transition dump site released SO_4^{2-} concentration reached 959.55 mg/kg of waste rock/week. All these massive sulfude waste rock samples were acid formation potential; moreover, the massive sulfide waste rock samples in sulfide dump site also had high concentration of SO_4^{2-} and were acid formation potential. Therefore this evidence indicate that massive sulfide waste rock in every dump site potentially released acid mine drainage to areas nearby mining site more than other waste rock types.

The results from this study shows that the massive sulfide waste rock tend to release the AMD in both transition and sulfide dump site. Consequently, not only transition dump site, but also sulfide dump site should concern the AMD generation problem.

CHAPTER V

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The main objectives of this study were to determine potential of acid mine drainage generation from waste rocks and rate of acid mine generation from waste rocks by measuring the cumulative release of sulfate per time and to investigate the concentrations of heavy metal in leachate solution from weathering cell tests.

Twenty-five wastes rock samples from the dump site areas in gold mine, Thailand were evaluated the AMD generation potential by using the weathering cell test for up to 144 days. Geochemical results gave the wide range of pH (pH ~ 3-9). In oxide dump and transition sites, pH levels were near-neutral and more and pH were neutral to more acidic (pH ~ 4-9) in sulfide site. Oxidation-neutralization curves were plotted in all samples between the cumulative Ca+Mg+Mn (neutralization product) and cumulative sulfate (oxidation product). These curves used to determine the potential of acid generation. The prediction based on the assumption that if the initial concentration of sulfate and Ca+Mg+Mn over the curve, the sample is non acid generation. On the other hand, if the point located under the curve, the sample is acid generation. The results showed samples having acid generation potential, classified into three groups as below:

Oxide dump site: TKW-11 (andesite)

Transition dump site: all samples were classified as massive sulfide(TKW-59 , TKW-60, TKW-61, TKW-62)

Sulfide dump site: TKW-39 (massive sulfide), TKW-40 (skarn), TKW-46 (mudstone)

These results indicated that in the long-term period, all three dumps sites have waste rocks, particular in transition and sulfide dump sites, which are capable of generating acid water into surrounding environments; consequently There have caused low pH and generated high concentration of toxic elements, which can cause adverse effects on livings health. For this reason, the properly treatment strategies should be

provided for this mining site to mitigate such adverse impacts on environment.

5.2 Recommendation

The study showed that the waste rocks in gold mine, Thailand may potentially generate AMD in the long periods after mine closure;thus, the AMD prevention and remediation should be proposed to reduce the adverse affects on environment. There have several types of AMD treatment method (Akcil and Koldas, 2006).

From the following equation

$$H_2SO_4 + CaCO_3 \rightarrow CaSO_4 + H_2O + CO_2$$

Calcium carbonate can used to neutralize the acid drainage problem (sulfate:carbonate = 1:1)

In addition, from the previous study, Potgieter-Vermaak *et al. (*2006) found that fly ash would be used as the most optimal and cost effective among their studied materials, which consisted of limestone, dolomite and fly ash. The condition in their experiment was the acid mine water contained 6000 mg/L sulphates, 1500 mg/L ferrous ions, 500 mg/L ferric ions, 400 mg/L magnesium ions, 300 mg/L calcium ions and low pH value (pH ~ 1.2). This condition was similar as the condition occurred in the gold mine, Thailand. Therefore the fly ash should be suggested to use for remediation methods. The amount of fly ash used was 250 grams/500ml of mine waste water. However, There is needed to do the research further for evaluating the remediation efficiency. Interestingly, in order to develop the method to predict accurately in field scale is needed to monitor and compared with the weathering cell method.

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APPENDICES

APPENDIX A

Weathering cell test data

TKW-2

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	8.06	227.00	146.90	0.001	0.0005	5	0.00	0.00	5.80	5.8	0.66	0.73
					0.001	0.0005	5	0.00	0.00	6.50	6.5	0.80	
4		8.36	94.70	123.80	0.01	0.005	3	0.00	5.10	6.60	1.5	-2.70	2.12
					0.01	0.005	3	0.00	6.60	8.30	1.7	-2.66	
8	2	7.70	147.60	199.10	0.01	0.005	3	0.01	0.00	2.80	2.8	2.60	3.50
					0.01	0.005	3	0.01	2.80	6.50	3.7	4.40	
11		7.22	107.00	176.10	0.01	0.005	1	0.01	21.10	22.30	1.2	1.40	1.40
					0.01	0.005	1	0.01	22.30	23.50	1.2	1.40	
15	3	8.44	109.50	209.20	0.01	0.005	1	0.01	0.00	1.30	1.3	1.60	1.60
					0.01	0.005	1	0.01	-	-	-	-	
18		8.54	100.20	246.60	0.01	0.005	1	0.01	6.50	8.20	1.7	2.40	2.40
					0.01	0.005	1	0.01	8.20	9.90	1.7	2.40	
22	4	8.79	102.80	188.40	0.01	0.005	1	0.01	6.50	8.40	1.9	2.80	2.50
					0.01	0.005	1	0.01	8.40	10.00	1.6	2.20	
25		8.71	109.20	117.90	0.01	0.005	1	0.01	0.00	1.50	1.5	2.00	2.20
					0.01	0.005	1	0.01	1.50	3.20	1.7	2.40	
29	5	8.71	99.80	237.60	0.01	0.005	1	0.01	0.00	1.20	1.2	1.40	1.90
					0.01	0.005	1	0.01	1.20	2.90	1.7	2.40	
32		8.56	102.00	71.00	0.01	0.005	1	0.01	15.10	17.20	2.1	3.20	2.60
					0.01	0.005	1	0.01	17.20	18.70	1.5	2.00	
36	6	7.61	113.10	163.50	0.01	0.005	1	0.01	12.00	13.60	1.6	2.20	2.20
					0.01	0.005	1	0.01	-	-	-	-	
39		8.60	105.90	149.00	0.01	0.005	1	0.01	9.90	11.50	1.6	2.20	2.10
					0.01	0.005	1	0.01	11.50	13.00	1.5	2.00	
43	7	8.55	184.70	227.10	0.01	0.005	1	0.01	9.80	11.40	1.6	2.20	2.10
					0.01	0.005	1	0.01	11.40	12.90	1.5	2.00	
46		8.85	104.90	189.10	0.01	0.005	1	0.01	6.20	7.80	1.6	2.20	2.10
					0.01	0.005	1	0.01	7.80	9.30	1.5	2.00	
50	8	8.21	89.80	148.80	0.01	0.005	1	0.01	0.00	1.50	1.5	2.00	2.20
					0.01	0.005	1	0.01	1.50	3.20	1.7	2.40	
53		8.38	99.30	306.00	0.01	0.005	1	0.01	19.70	21.60	1.9	2.80	2.80
					0.01	0.005	1	0.01	21.60	23.50	1.9	2.80	
57	9	8.53	108.30	202.30	0.01	0.005	1	0.01	8.40	10.30	1.9	2.80	2.90
					0.01	0.005	1	0.01	10.30	12.30	2.0	3.00	
60		8.12	102.30	301.20	0.01	0.005	1	0.01	0.00	2.00	2.0	3.00	2.90
					0.01	0.005	1	0.01	2.00	3.90	1.9	2.80	
64	10	8.59	92.50	258.90	0.01	0.005	1	0.01	20.50	24.90	4.4	7.80	5.30
					0.01	0.005	1	0.01	1.20	3.10	1.9	2.80	
67		7.71	92.90	213.60	0.01	0.005	1	0.01	0.00	1.90	1.9	2.80	2.70
					0.01	0.005	1	0.01	1.90	3.70	1.8	2.60	
71	11	7.07	156.10	290.90	0.01	0.005	1	0.01	6.60	8.80	2.2	3.40	3.30
					0.01	0.005	1	0.01	8.80	10.90	2.1	3.20	
74		8.81	94.60	195.80	0.01	0.005	1	0.01	3.90	6.00	2.1	3.20	3.10
					0.01	0.005	1	0.01	6.00	8.00	2.0	3.00	

TKW-2

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	8.70	82.10	181.70	0.01	0.005	1	0.01	1.80	3.90	2.1	3.20	3.00
					0.01	0.005	1	0.01	3.90	5.80	1.9	2.80	
81		8.11	84.80	120.40	0.01	0.005	1	0.10	2.30	2.50	0.2	3.00	3.00
					0.01	0.005	1	0.10	2.50	2.70	0.2	3.00	
85	13	7.25	80.20	208.20	0.01	0.005	1	0.10	2.30	2.55	0.3	4.00	3.50
					0.01	0.005	1	0.10	2.55	2.75	0.2	3.00	
88		8.74	93.60	284.70	0.01	0.005	1	0.10	3.15	3.35	0.2	3.00	3.00
					0.01	0.005	1	0.10	3.35	3.55	0.2	3.00	
92	14	8.52	97.60	193.50	0.01	0.005	1	0.10	0.45	0.65	0.2	3.00	3.00
					0.01	0.005	1	0.10	0.65	0.85	0.2	3.00	
95		7.82	115.50	274.40	0.01	0.005	1	0.10	5.30	5.50	0.2	3.00	3.00
					0.01	0.005	1	0.10	5.50	5.70	0.2	3.00	
99	15	8.60	79.60	333.90	0.01	0.005	1	0.10	6.25	6.45	0.2	3.00	3.00
					0.01	0.005	1	0.10	6.45	6.65	0.2	3.00	
102		8.56	95.80	173.00	0.01	0.005	1	0.10	0.50	0.75	0.3	4.00	3.50
					0.01	0.005	1	0.10	0.75	0.95	0.2	3.00	
106	16	8.26	87.80	277.00	0.01	0.005	1	0.10	3.40	3.65	0.3	4.00	3.00
					0.01	0.005	1	0.10	3.65	3.80	0.2	2.00	
109		8.35	89.90	282.80	0.01	0.005	1	0.10	4.85	5.10	0.3	4.00	3.00
					0.01	0.005	1	0.10	5.10	5.25	0.2	2.00	
113	17	8.53	107.50	344.40	0.01	0.005	1	0.10	4.05	4.25	0.2	3.00	3.00
					0.01	0.005	1	0.10	4.25	4.45	0.2	3.00	
116		8.37	88.70	182.80	0.01	0.005	1	0.10	1.05	1.30	0.3	4.00	4.00
					0.01	0.005	1	0.10	1.30	1.55	0.3	4.00	
120	18	8.44	85.40	318.90	0.01	0.005	1	0.10	2.40	2.65	0.3	4.00	3.50
					0.01	0.005	1	0.10	2.65	2.85	0.2	3.00	
123		8.53	103.00	148.30	0.01	0.005	1	0.10	3.55	3.75	0.2	3.00	3.00
					0.01	0.005	1	0.10	3.75	3.95	0.2	3.00	
127	19	8.42	86.90	294.40	0.01	0.005	1	0.10	4.40	4.60	0.2	3.00	3.00
					0.01	0.005	1	0.10	4.60	4.80	0.2	3.00	
130		8.67	96.50	352.70	0.01	0.005	1	0.10	1.15	1.35	0.2	3.00	3.00
					0.01	0.005	1	0.10	1.35	1.55	0.2	3.00	
134	20	8.12	82.30	187.80	0.01	0.005	1	0.10	2.85	3.10	0.3	4.00	3.00
					0.01	0.005	1	0.10	3.10	3.25	0.2	2.00	
137		8.62	108.40	328.30	0.01	0.005	1	0.10	8.70	8.90	0.2	3.00	3.00
					0.01	0.005	1	0.10	8.90	9.10	0.2	3.00	
141	21	8.66	84.10	351.30	0.01	0.005	1	0.10	3.85	4.05	0.2	3.00	3.00
					0.01	0.005	1	0.10	4.05	4.25	0.2	3.00	
144		8.78	73.50	313.60	0.01	0.005	1	0.10	6.80	7.05	0.3	4.00	4.00
					0.01	0.005	1	0.10	7.05	7.30	0.3	4.00	

TKW-6

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	8.20	227.00	149.00	0.001	0.0005	6.00	0.00	0.00	5.70	5.70	0.54	0.57
					0.001	0.0005	6.00	0.00	0.00	6.00	6.00	0.60	
4		8.19	167.20	125.70	0.001	0.0005	10.00	0.00	0.00	1.20	1.20	-0.76	-0.78
					0.001	0.0005	10.00	0.00	1.20	2.20	1.00	-0.80	
8	2	7.81	100.50	73.70	0.010	0.005	2.00	0.01	16.90	19.60	2.70	3.40	3.30
					0.010	0.005	2.00	0.01	19.60	22.20	2.60	3.20	
11		7.81	141.10	197.60	0.010	0.005	1.00	0.01	2.20	3.50	1.30	1.60	1.30
					0.010	0.005	1.00	0.01	3.50	4.50	1.00	1.00	
15	3	8.26	151.50	218.10	0.010	0.005	1.00	0.01	20.30	21.40	1.10	1.20	1.20
					0.010	0.005	1.00	0.01	21.40	22.50	1.10	1.20	
18		8.70	143.00	204.90	0.010	0.005	1.00	0.01	9.80	11.40	1.60	2.20	2.10
					0.010	0.005	1.00	0.01	11.40	12.90	1.50	2.00	
22	4	8.65	138.40	215.10	0.010	0.005	1.00	0.01	0.00	1.90	1.90	2.80	2.80
					0.010	0.005	1.00	0.01	-	-	-	0	
25		8.14	145.50	236.50	0.010	0.005	1.00	0.01	6.70	8.00	1.30	1.60	1.80
					0.010	0.005	1.00	0.01	8.00	9.50	1.50	2.00	
29	5	8.57	140.30	112.00	0.010	0.005	1.00	0.01	19.90	21.20	1.30	1.60	1.70
					0.010	0.005	1.00	0.01	21.20	22.60	1.40	1.80	
32		7.94	146.20	83.20	0.010	0.005	1.00	0.01	9.80	11.10	1.30	1.60	1.90
					0.010	0.005	1.00	0.01	11.10	12.70	1.60	2.20	
36	6	8.50	142.40	214.70	0.010	0.005	1.00	0.01	18.60	19.70	1.10	1.20	1.30
					0.010	0.005	1.00	0.01	19.70	20.90	1.20	1.40	
39		8.47	136.20	187.00	0.010	0.005	1.00	0.01	9.00	10.50	1.50	2.00	1.80
					0.010	0.005	1.00	0.01	10.50	11.80	1.30	1.60	
43	7	8.51	135.60	265.70	0.010	0.005	1.00	0.01	12.20	13.70	1.50	2.00	1.80
					0.010	0.005	1.00	0.01	13.70	15.00	1.30	1.60	
46		8.84	138.80	154.10	0.010	0.005	1.00	0.01	3.30	4.70	1.40	1.80	1.90
					0.010	0.005	1.00	0.01	4.70	6.20	1.50	2.00	
50	8	8.46	134.60	323.30	0.010	0.005	1.00	0.01	15.10	16.40	1.30	1.60	1.70
					0.010	0.005	1.00	0.01	16.40	17.80	1.40	1.80	
53		8.33	154.00	248.80	0.010	0.005	1.00	0.01	0.00	1.60	1.60	2.20	2.30
					0.010	0.005	1.00	0.01	1.60	3.30	1.70	2.40	
57	9	8.32	144.60	230.70	0.010	0.005	1.00	0.01	12.60	14.40	1.80	2.60	2.60
					0.010	0.005	1.00	0.01	-	-	-	-	
60		8.08	150.30	300.40	0.010	0.005	1.00	0.01	15.40	17.10	1.70	2.40	2.50
					0.010	0.005	1.00	0.01	17.10	18.90	1.80	2.60	
64	10	8.59	130.60	212.00	0.010	0.005	1.00	0.01	3.10	5.00	1.90	2.80	2.70
					0.010	0.005	1.00	0.01	5.00	6.80	1.80	2.60	
67		7.35	133.20	275.80	0.010	0.005	1.00	0.01	3.70	5.30	1.60	2.20	2.60
					0.010	0.005	1.00	0.01	5.30	7.30	2.00	3.00	
71	11	8.32	159.20	304.10	0.010	0.005	1.00	0.01	17.70	19.40	1.70	2.40	2.40
					0.010	0.005	1.00	0.01	19.40	21.10	1.70	2.40	
74		8.45	128.20	253.50	0.010	0.005	1.00	0.01	5.70	7.50	1.80	2.60	2.70
					0.010	0.005	1.00	0.01	7.50	9.40	1.90	2.80	

TKW-6

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	8.23	126.00	88.00	0.010	0.005	1.00	0.10	0.95	1.10	0.15	2.00	3.00
					0.010	0.005	1.00	0.10	1.10	1.35	0.25	4.00	
81		8.45	117.70	32.80	0.010	0.005	1.00	0.10	0.50	0.90	0.40	7.00	6.00
					0.010	0.005	1.00	0.10	0.90	1.20	0.30	5.00	
85	13	8.44	130.80	299.4	0.010	0.005	1.00	0.10	1.60	1.85	0.25	4.00	3.00
					0.010	0.005	1.00	0.10	1.85	2.00	0.15	2.00	
88		8.42	124.60	171.40	0.010	0.005	1.00	0.10	3.55	3.75	0.20	3.00	3.50
					0.010	0.005	1.00	0.10	3.75	4.00	0.25	4.00	
92	14	7.92	129.40	245.30	0.010	0.005	1.00	0.10	1.20	1.45	0.25	4.00	3.50
					0.010	0.005	1.00	0.10	1.45	1.65	0.20	3.00	
95		7.59	119.30	145.30	0.010	0.005	1.00	0.10	3.45	3.65	0.20	3.00	3.00
					0.010	0.005	1.00	0.10	3.65	3.85	0.20	3.00	
99	15	8.23	121.20	182.90	0.010	0.005	1.00	0.10	1.30	1.50	0.20	3.00	3.50
					0.010	0.005	1.00	0.10	1.50	1.75	0.25	4.00	
102		8.35	149.00	206.50	0.010	0.005	1.00	0.10	0.00	0.20	0.20	3.00	3.50
					0.010	0.005	1.00	0.10	0.20	0.45	0.25	4.00	
106	16	8.20	108.10	203.60	0.010	0.005	1.00	0.10	3.50	3.70	0.20	3.00	3.00
					0.010	0.005	1.00	0.10	3.70	3.90	0.20	3.00	
109		8.01	121.30	212.00	0.010	0.005	1.00	0.10	1.10	1.30	0.20	3.00	4.50
					0.010	0.005	1.00	0.10	1.20	1.55	0.35	6.00	
113	17	7.74	103.30	190.10	0.010	0.005	1.00	0.10	1.40	1.60	0.20	3.00	3.00
					0.010	0.005	1.00	0.10	1.60	1.80	0.20	3.00	
116		8.37	117.90	199.30	0.010	0.005	1.00	0.10	3.60	3.85	0.25	4.00	4.50
					0.010	0.005	1.00	0.10	3.85	4.15	0.30	5.00	
120	18	7.82	107.70	229.00	0.010	0.005	1.00	0.10	3.60	3.80	0.20	3.00	3.00
					0.010	0.005	1.00	0.10	3.80	4.00	0.20	3.00	
123		7.55	136.10	180.50	0.010	0.005	1.00	0.10	0.00	0.20	0.20	3.00	3.00
					0.010	0.005	1.00	0.10	0.20	0.40	0.20	3.00	
127	19	8.31	112.70	215.80	0.010	0.005	1.00	0.10	3.20	3.40	0.20	3.00	3.00
					0.010	0.005	1.00	0.10	-	-	-	-	
130		7.73	113.80	195.30	0.010	0.005	1.00	0.10	2.00	2.20	0.20	3.00	3.00
					0.010	0.005	1.00	0.10	2.20	2.40	0.20	3.00	
134	20	8.49	99.90	223.60	0.010	0.005	1.00	0.10	3.40	3.55	0.15	2.00	2.50
					0.010	0.005	1.00	0.10	3.55	3.75	0.20	3.00	
137		8.46	102.60	453.40	0.010	0.005	1.00	0.10	0.00	0.20	0.20	3.00	3.50
					0.010	0.005	1.00	0.10	0.20	0.45	0.25	4.00	
141	21	8.36	100.30	247.20	0.010	0.005	1.00	0.10	3.90	4.10	0.20	3.00	3.00
					0.010	0.005	1.00	0.10	4.10	4.30	0.20	3.00	
144		8.54	169.10	230.00	0.010	0.005	1.00	0.10	1.80	2.00	0.20	3.00	4.00
					0.010	0.005	1.00	0.10	2.00	2.30	0.30	5.00	

TKW-8

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	8.30	214.00	72.90	0.001	0.0005	4.0	0.001	1.20	1.60	0.40	-0.32	0.00
					0.001	0.0005	4.0	0.001	1.60	2.20	0.60	-0.28	
4		8.23	181.80	49.30	0.001	0.0005	6.0	0.001	0.00	5.90	5.90	0.58	0.71
					0.001	0.0005	6.0	0.001	5.90	13.10	7.20	0.84	
8	2	8.06	144.80	441.50	0.01	0.0050	3.0	0.010	0.00	3.80	3.80	4.60	4.70
					0.01	0.0050	3.0	0.010	3.80	7.70	3.90	4.80	
11		7.83	99.10	111.50	0.01	0.0050	1.5	0.010	0.00	2.00	2.00	2.50	2.50
					0.01	0.0050	1.5	0.010	2.00	4.00	2.00	2.50	
15	3	8.06	159.80	107.60	0.01	0.0050	1.0	0.010	17.00	18.50	1.50	2.00	1.70
					0.01	0.0050	1.0	0.010	18.50	19.70	1.20	1.40	
18		8.54	151.70	21.20	0.01	0.0050	1.0	0.010	9.30	10.50	1.20	1.40	1.30
					0.01	0.0050	1.0	0.010	10.50	11.60	1.10	1.20	
22	4	8.28	213.00	202.40	0.01	0.0050	1.0	0.010	12.90	14.70	1.80	2.60	2.40
					0.01	0.0050	1.0	0.010	14.70	16.30	1.60	2.20	
25		8.51	190.70	221.80	0.01	0.0050	1.0	0.010	12.30	14.00	1.70	2.40	2.40
					0.01	0.0050	1.0	0.010	14.00	15.70	1.70	2.40	
29	5	8.42	187.60	346.40	0.01	0.0050	1.0	0.010	5.00	6.70	1.70	2.40	2.40
					0.01	0.0050	1.0	0.010	6.70	8.40	1.70	2.40	
32		8.39	179.30	88.40	0.01	0.0050	1.0	0.010	13.70	17.10	3.40	5.80	3.90
					0.01	0.0050	1.0	0.010	17.10	18.60	1.50	2.00	
36	6	8.40	189.20	190.60	0.01	0.0050	1.0	0.010	2.60	4.00	1.40	1.80	2.00
					0.01	0.0050	1.0	0.010	4.00	5.60	1.60	2.20	
39		8.14	167.50	183.40	0.01	0.0050	1.0	0.010	0.00	1.50	1.50	2.00	2.00
					0.01	0.0050	1.0	0.010	1.50	3.00	1.50	2.00	
43	7	8.33	176.10	212.70	0.01	0.0050	1.0	0.010	0.00	1.50	1.50	2.00	1.90
					0.01	0.0050	1.0	0.010	1.50	2.90	1.40	1.80	
46		8.45	149.50	172.90	0.01	0.0050	1.0	0.010	12.00	13.50	1.50	2.00	2.10
					0.01	0.0050	1.0	0.010	13.50	15.10	1.60	2.20	
50	8	8.36	168.30	292.80	0.01	0.0050	1.0	0.010	11.40	13.10	1.70	2.40	2.40
					0.01	0.0050	1.0	0.010	13.10	14.80	1.70	2.40	
53		7.40	154.40	236.20	0.01	0.0050	1.0	0.010	3.90	5.60	1.70	2.40	2.60
					0.01	0.0050	1.0	0.010	5.60	7.50	1.90	2.80	
57	9	7.06	184.50	242.60	0.01	0.0050	1.0	0.010	16.10	18.00	1.90	2.80	2.70
					0.01	0.0050	1.0	0.010	18.00	19.80	1.80	2.60	
60		8.62	172.80	295.40	0.01	0.0050	1.0	0.010	7.50	9.20	1.70	2.40	2.50
					0.01	0.0050	1.0	0.010	9.20	11.00	1.80	2.60	
64	10	7.02	171.10	267.90	0.01	0.0050	1.0	0.010	6.80	8.60	1.80	2.60	2.60
					0.01	0.0050	1.0	0.010	8.60	10.40	1.80	2.60	
67		8.23	173.80	248.50	0.01	0.0050	1.0	0.010	14.00	15.60	1.60	2.20	2.30
					0.01	0.0050	1.0	0.010	15.60	17.30	1.70	2.40	
71	11	8.15	308.00	297.10	0.01	0.0050	1.0	0.010	16.30	18.10	1.80	2.60	2.70
					0.01	0.0050	1.0	0.010	18.10	20.00	1.90	2.80	
74		8.26	167.70	251.80	0.01	0.0050	1.0	0.010	16.70	18.50	1.80	2.60	2.60
					0.01	0.0050	1.0	0.010	18.50	20.30	1.80	2.60	

TKW-8

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	7.57	141.30	141.80	0.01	0.0050	1.0	0.010	13.70	15.80	2.10	3.20	2.90
					0.01	0.0050	1.0	0.010	15.80	17.60	1.80	2.60	
81		7.51	164.40	134.70	0.01	0.0050	1.0	0.100	0.25	0.45	0.20	3.00	3.00
					0.01	0.0050	1.0	0.100	0.45	0.65	0.20	3.00	
85	13	8.19	158	195.70	0.01	0.0050	1.0	0.100	6.00	6.20	0.20	3.00	3.00
					0.01	0.0050	1.0	0.100	6.20	6.40	0.20	3.00	
88		8.51	145.70	277.50	0.01	0.0050	1.0	0.100	0.00	0.15	0.15	2.00	2.00
					0.01	0.0050	1.0	0.100	0.15	0.30	0.15	2.00	
92	14	8.56	156.30	195.00	0.01	0.0050	1.0	0.100	2.10	2.30	0.20	3.00	3.00
					0.01	0.0050	1.0	0.100	2.30	2.50	0.20	3.00	
95		7.92	154.40	277.10	0.01	0.0050	1.0	0.100	1.55	1.75	0.20	3.00	3.00
					0.01	0.0050	1.0	0.100	1.75	1.95	0.20	3.00	
99	15	8.33	144.20	330.40	0.01	0.0050	1.0	0.100	4.05	4.25	0.20	3.00	3.00
					0.01	0.0050	1.0	0.100	4.25	4.45	0.20	3.00	
102		8.25	185.6	164.90	0.01	0.0050	1.0	0.100	2.60	2.85	0.25	4.00	3.00
					0.01	0.0050	1.0	0.100	2.85	3.00	0.15	2.00	
106	16	8.00	157.00	249.40	0.01	0.0050	1.0	0.100	0.50	0.65	0.15	2.00	2.50
					0.01	0.0050	1.0	0.100	0.65	0.85	0.20	3.00	
109		7.92	141.60	304.00	0.01	0.0050	1.0	0.100	3.55	3.75	0.20	3.00	3.50
					0.01	0.0050	1.0	0.100	3.75	4.00	0.25	4.00	
113	17	8.23	170.80	312.80	0.01	0.0050	1.0	0.100	4.90	5.10	0.20	3.00	3.00
					0.01	0.0050	1.0	0.100	5.10	5.30	0.20	3.00	
116		8.27	142.50	187.70	0.01	0.0050	1.0	0.100	2.35	2.55	0.20	3.00	3.50
					0.01	0.0050	1.0	0.100	2.55	2.80	0.25	4.00	
120	18	8.16	158.70	336.70	0.01	0.0050	1.0	0.100	1.65	1.85	0.20	3.00	3.00
					0.01	0.0050	1.0	0.100	1.85	2.05	0.20	3.00	
123		8.41	142.80	202.70	0.01	0.0050	1.0	0.100	6.50	6.70	0.20	3.00	3.00
					0.01	0.0050	1.0	0.100	6.70	6.90	0.20	3.00	
127	19	8.17	150.10	301.40	0.01	0.0050	1.0	0.100	4.80	4.95	0.15	2.00	2.45
					0.01	0.0050	1.0	0.100	4.95	5.15	0.19	2.90	
130		7.94	136.30	338.50	0.01	0.0050	1.0	0.100	4.60	4.80	0.20	3.00	2.50
					0.01	0.0050	1.0	0.100	4.80	4.95	0.15	2.00	
134	20	8.12	82.30	187.80	0.01	0.0050	1.0	0.100	2.85	3.10	0.25	4.00	3.00
					0.01	0.0050	1.0	0.100	3.10	3.25	0.15	2.00	
137		8.30	165.00	389.70	0.01	0.0050	1.0	0.100	4.30	4.50	0.20	3.00	3.00
					0.01	0.0050	1.0	0.100	4.50	4.70	0.20	3.00	
141	21	8.39	151.80	343.60	0.01	0.0050	1.0	0.100	5.05	5.25	0.20	3.00	3.00
					0.01	0.0050	1.0	0.100	5.25	5.45	0.20	3.00	
144		8.78	73.50	313.60	0.01	0.0050	1.0	0.100	6.80	7.05	0.25	4.00	4.00
					0.01	0.0050	1.0	0.100	7.05	7.30	0.25	4.00	

TKW-11

Days	Cycle no.	pH	EC (µS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	8.45	364.00	144.20	0.001	0.0005	8.50	0.001	0.00	7.70	7.70	0.69	0.69
					0.001	0.0005	8.50	0.001	0.00	7.70	7.70	0.69	
4		8.17	225.00	166.40	0.001	0.0005	10.00	0.001	10.90	12.20	1.30	-0.74	-0.74
					0.001	0.0005	10.00	0.001	12.20	13.50	1.30	-0.74	
8	2	8.18	167.40	176.60	0.01	0.0050	2.00	0.01	12.00	14.60	2.60	3.20	3.00
					0.01	0.0050	2.00	0.01	14.60	17.00	2.40	2.80	
11		7.09	103.10	165.60	0.01	0.0050	1.00	0.01	0.00	1.10	1.10	1.20	1.20
					0.01	0.0050	1.00	0.01	1.10	2.20	1.10	1.20	
15	3	8.43	157.40	217.40	0.01	0.0050	1.00	0.01	10.00	11.20	1.20	1.40	1.40
					0.01	0.0050	1.00	0.01	11.20	12.40	1.20	1.40	
18		8.37	77.50	182.30	0.01	0.0050	1.00	0.01	3.30	5.00	1.70	2.40	2.60
					0.01	0.0050	1.00	0.01	5.00	6.90	1.90	2.80	
22	4	8.74	144.40	282.10	0.01	0.0050	1.00	0.01	11.40	12.90	1.50	2.00	2.10
					0.01	0.0050	1.00	0.01	12.90	14.50	1.60	2.20	
25		8.59	125.40	254.10	0.01	0.0050	1.00	0.01	9.50	10.90	1.40	1.80	1.80
					0.01	0.0050	1.00	0.01	10.90	12.30	1.40	1.80	
29	5	8.53	132.00	109,6	0.01	0.0050	1.00	0.01	0.00	1.20	1.20	1.40	1.90
					0.01	0.0050	1.00	0.01	1.20	2.90	1.70	2.40	
32		8.74	88.60	57.30	0.01	0.0050	1.00	0.01	18.60	20.30	1.70	2.40	2.20
					0.01	0.0050	1.00	0.01	20.30	21.80	1.50	2.00	
36	6	8.57	117.70	288.30	0.01	0.0050	1.00	0.01	0.00	1.20	1.20	1.40	1.60
					0.01	0.0050	1.00	0.01	1.20	2.60	1.40	1.80	
39		8.51	132.60	165.80	0.01	0.0050	1.00	0.01	6.10	7.70	1.60	2.20	1.90
					0.01	0.0050	1.00	0.01	7.70	9.00	1.30	1.60	
43	7	8.26	125.00	214.50	0.01	0.0050	1.00	0.01	0.00	1.40	1.40	1.80	1.60
					0.01	0.0050	1.00	0.01	1.40	2.60	1.20	1.40	
46		8.52	99.90	113.30	0.01	0.0050	1.00	0.01	3.10	4.60	1.50	2.00	2.00
					0.01	0.0050	1.00	0.01	4.60	6.10	1.50	2.00	
50	8	8.45	18.80	429.10	0.01	0.0050	1.00	0.01	6.20	7.60	1.40	1.80	1.80
					0.01	0.0050	1.00	0.01	7.60	9.00	1.40	1.80	
53		8.03	111.50	316.30	0.01	0.0050	1.00	0.01	6.70	8.60	1.90	2.80	2.80
					0.01	0.0050	1.00	0.01	8.60	10.50	1.90	2.80	
57	9	8.41	112.70	252.70	0.01	0.0050	1.00	0.01	11.30	13.50	2.20	3.40	3.10
					0.01	0.0050	1.00	0.01	13.50	15.40	1.90	2.80	
60		8.06	119.00	305.70	0.01	0.0050	1.00	0.01	11.00	12.80	1.80	2.60	2.50
					0.01	0.0050	1.00	0.01	12.80	14.50	1.70	2.40	
64	10	8.14	102.10	283.80	0.01	0.0050	1.00	0.01	7.50	9.40	1.90	2.80	2.60
					0.01	0.0050	1.00	0.01	9.40	11.10	1.70	2.40	
67		7.27	135.40	279.60	0.01	0.0050	1.00	0.01	10.00	12.10	2.10	3.20	3.20
					0.01	0.0050	1.00	0.01	12.10	14.20	2.10	3.20	
71	11	8.11	162.30	305.90	0.01	0.0050	1.00	0.01	14.10	16.00	1.90	2.80	2.60
					0.01	0.0050	1.00	0.01	16.00	17.70	1.70	2.40	
74		8.39	113.90	197.60	0.01	0.0050	1.00	0.01	9.40	11.40	2.00	3.00	3.00
					0.01	0.0050	1.00	0.01	11.40	13.40	2.00	3.00	

TKW-11

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	8.43	118.80	135.80	0.01	0.0050	1.00	0.01	16.20	18.10	1.90	2.80	2.80
					0.01	0.0050	1.00	0.01	18.10	20.00	1.90	2.80	
81		7.95	115.80	129.10	0.01	0.0050	1.00	0.1	3.05	3.25	0.20	3.00	3.00
					0.01	0.0050	1.00	0.1	3.25	3.45	0.20	3.00	
85	13	8.3	123.8	132.2	0.01	0.0050	1.00	0.1	5.55	5.80	0.25	4.00	3.50
					0.01	0.0050	1.00	0.1	5.80	6.00	0.20	3.00	
88		8.37	138.50	280.90	0.01	0.0050	1.00	0.1	2.40	2.55	0.15	2.00	3.00
					0.01	0.0050	1.00	0.1	2.55	2.80	0.25	4.00	
92	14	8.37	127.00	151.30	0.01	0.0050	1.00	0.1	1.25	1.45	0.20	3.00	3.50
					0.01	0.0050	1.00	0.1	1.45	1.70	0.25	4.00	
95		7.88	124.20	273.70	0.01	0.0050	1.00	0.1	3.65	3.90	0.25	4.00	3.00
					0.01	0.0050	1.00	0.1	3.90	4.05	0.15	2.00	
99	15	8.52	94.50	323.70	0.01	0.0050	1.00	0.1	4.45	4.65	0.20	3.00	3.00
					0.01	0.0050	1.00	0.1	4.65	4.85	0.20	3.00	
102		8.39	105.70	178.20	0.01	0.0050	1.00	0.1	4.25	4.40	0.15	2.00	2.50
					0.01	0.0050	1.00	0.1	4.40	4.60	0.20	3.00	
106	16	8.19	99.90	298.7	0.01	0.0050	1.00	0.1	0.85	1.05	0.20	3.00	3.50
					0.01	0.0050	1.00	0.1	1.05	1.30	0.25	4.00	
109		8.34	269.00	384.20	0.01	0.0050	1.00	0.1	6.00	6.25	0.25	4.00	4.00
					0.01	0.0050	1.00	0.1	6.25	6.50	0.25	4.00	
113	17	8.33	117.20	349.10	0.01	0.0050	1.00	0.1	3.55	3.85	0.30	5.00	4.00
					0.01	0.0050	1.00	0.1	3.85	4.05	0.20	3.00	
116		8.38	98.00	183.70	0.01	0.0050	1.00	0.1	4.90	5.10	0.20	3.00	3.00
					0.01	0.0050	1.00	0.1	5.10	5.30	0.20	3.00	
120	18	8.32	102.10	312.00	0.01	0.0050	1.00	0.1	5.10	5.30	0.20	3.00	3.00
					0.01	0.0050	1.00	0.1	5.30	5.50	0.20	3.00	
123		8.44	112.10	207.20	0.01	0.0050	1.00	0.1	5.70	5.90	0.20	3.00	3.00
					0.01	0.0050	1.00	0.1	5.90	6.10	0.20	3.00	
127	19	8.31	109.40	312.50	0.01	0.0050	1.00	0.1	2.55	2.75	0.20	3.00	3.00
					0.01	0.0050	1.00	0.1	2.75	2.95	0.20	3.00	
130		8.25	103.10	333.50	0.01	0.0050	1.00	0.1	5.70	5.90	0.20	3.00	3.00
					0.01	0.0050	1.00	0.1	5.90	6.10	0.20	3.00	
134	20	7.26	116.90	463.70	0.01	0.0050	1.00	0.1	0.00	0.20	0.20	3.00	3.00
					0.01	0.0050	1.00	0.1	0.20	0.40	0.20	3.00	
137		8.28	122.70	345.70	0.01	0.0050	1.00	0.1	5.55	5.75	0.20	3.00	3.00
					0.01	0.0050	1.00	0.1	5.75	5.95	0.20	3.00	
141	21	8.45	108.70	315.10	0.01	0.0050	1.00	0.1	7.20	7.40	0.20	3.00	3.00
					0.01	0.0050	1.00	0.1	7.40	7.60	0.20	3.00	
144		8.42	144.10	483.20	0.01	0.0050	1.00	0.1	2.15	2.35	0.20	3.00	2.50
					0.01	0.0050	1.00	0.1	2.35	2.50	0.15	2.00	

TKW-14

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	7.94	918.00	145.10	0.001	0.0005	6.00	0.001	0.00	6.90	6.90	0.78	0.39
					0.001	0.0005	6.00	0.001	0.00	7.00	7.00	0.80	
4		7.96	354.00	169.60	0.001	0.0005	10.00	0.001	13.50	15.00	1.50	-0.70	0.00
					0.001	0.0005	10.00	0.001	15.00	16.40	1.40	-0.72	
8	2	8.40	248.00	194.60	0.010	0.0050	2.00	0.010	0.00	3.80	3.80	5.60	2.80
					0.010	0.0050	2.00	0.010	3.80	7.70	3.90	5.80	
11		7.83	99.10	111.50	0.010	0.0050	1.50	0.010	5.50	8.10	2.60	3.70	1.85
					0.010	0.0050	1.50	0.010	8.10	10.60	2.50	3.50	
15	3	8.00	219.00	97.40	0.010	0.0050	1.00	0.010	11.90	13.20	1.30	1.60	0.80
					0.010	0.0050	1.00	0.010	13.20	14.50	1.30	1.60	
18		8.13	176.10	178.90	0.010	0.0050	1.00	0.010	17.60	19.10	1.50	2.00	1.00
					0.010	0.0050	1.00	0.010	19.10	20.80	1.70	2.40	
22	4	8.34	188.80	259.40	0.010	0.0050	1.00	0.010	3.80	5.60	1.80	2.60	1.30
					0.010	0.0050	1.00	0.010	5.60	7.30	1.70	2.40	
25		8.45	167.60	49.80	0.010	0.0050	1.00	0.010	12.70	14.50	1.80	2.60	1.30
					0.010	0.0050	1.00	0.010	14.50	16.40	1.90	2.80	
29	5	7.54	160.50	169.20	0.010	0.0050	1.00	0.010	2.90	4.80	1.90	2.80	1.40
					0.010	0.0050	1.00	0.010	4.80	6.90	2.10	3.20	
32		8.46	148.90	64.80	0.010	0.0050	1.00	0.010	6.50	8.10	1.60	2.20	1.10
					0.010	0.0050	1.00	0.010	8.10	10.00	1.90	2.80	
36	6	8.40	153.30	204.60	0.010	0.0050	1.00	0.010	5.40	7.10	1.70	2.40	1.20
					0.010	0.0050	1.00	0.010	7.10	8.90	1.80	2.60	
39		8.30	155.30	163.80	0.010	0.0050	1.00	0.010	2.70	4.30	1.60	2.20	1.10
					0.010	0.0050	1.00	0.010	4.30	5.80	1.50	2.00	
43	7	8.32	163.60	211.10	0.010	0.0050	1.00	0.010	9.10	10.60	1.50	2.00	1.00
					0.010	0.0050	1.00	0.010	10.60	12.30	1.70	2.40	
46		8.04	783.00	168.50	0.010	0.0050	1.00	0.010	0.00	1.80	1.80	2.60	1.30
					0.010	0.0050	1.00	0.010	1.80	3.30	1.50	2.00	
50	8	8.12	180.40	131.80	0.010	0.0050	1.00	0.010	9.00	10.60	1.60	2.20	1.10
					0.010	0.0050	1.00	0.010	10.60	12.20	1.60	2.20	
53		8.69	153.40	244.30	0.010	0.0050	1.00	0.010	7.80	9.80	2.00	3.00	1.50
					0.010	0.0050	1.00	0.010	9.80	11.70	1.90	2.80	
57	9	8.32	181.00	232.20	0.010	0.0050	1.00	0.010	12.30	14.20	1.90	2.80	1.40
					0.010	0.0050	1.00	0.010	14.20	16.10	1.90	2.80	
60		7.05	159.80	303.00	0.010	0.0050	1.00	0.010	18.90	20.80	1.90	2.80	1.40
					0.010	0.0050	1.00	0.010	20.80	22.80	2.00	3.00	
64	10	7.85	151.30	271.20	0.010	0.0050	1.00	0.010	9.20	11.20	2.00	3.00	1.50
					0.010	0.0050	1.00	0.010	11.20	13.20	2.00	3.00	
67		6.52	154.30	243.40	0.010	0.0050	1.00	0.010	14.20	16.30	2.10	3.20	1.60
					0.010	0.0050	1.00	0.010	16.30	18.30	2.00	3.00	
71	11	8.55	287.00	295.50	0.010	0.0050	1.00	0.010	3.80	5.70	1.90	2.80	1.40
					0.010	0.0050	1.00	0.010	5.70	7.70	2.00	3.00	
74		7.60	154.80	230.40	0.010	0.0050	1.00	0.010	20.30	22.40	2.10	3.20	1.60
					0.010	0.0050	1.00	0.010	0.00	1.80	1.80	2.60	

TKW-14

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	8.14	146.10	103.90	0.010	0.0050	1.00	0.010	20.00	22.00	2.00	3.00	1.50
					0.010	0.0050	1.00	0.010	0.00	1.80	1.80	2.60	
81		7.53	123.70	139.80	0.010	0.0050	1.00	0.100	3.85	4.05	0.20	3.00	1.50
					0.010	0.0050	1.00	0.100	4.05	4.30	0.25	4.00	
85	13	8.05	125.3	212	0.010	0.0050	1.00	0.100	4.55	4.85	0.30	5.00	2.50
					0.010	0.0050	1.00	0.100	4.85	5.10	0.25	4.00	
88		8.44	118.80	455.30	0.010	0.0050	1.00	0.100	5.05	5.25	0.20	3.00	1.50
					0.010	0.0050	1.00	0.100	5.25	5.55	0.30	5.00	
92	14	8.31	138.80	98.30	0.010	0.0050	1.00	0.100	5.20	5.45	0.25	4.00	2.00
					0.010	0.0050	1.00	0.100	5.45	5.60	0.15	2.00	
95		7.80	125.00	217.60	0.010	0.0050	1.00	0.100	3.25	3.50	0.25	4.00	2.00
					0.010	0.0050	1.00	0.100	3.50	3.65	0.15	2.00	
99	15	8.22	119.30	332.70	0.010	0.0050	1.00	0.100	5.40	5.65	0.25	4.00	2.00
					0.010	0.0050	1.00	0.100	5.65	5.80	0.15	2.00	
102		8.28	129.60	167.70	0.010	0.0050	1.00	0.100	0.95	1.15	0.20	3.00	1.50
					0.010	0.0050	1.00	0.100	1.15	1.35	0.20	3.00	
106	16	8.20	117.60	265.70	0.010	0.0050	1.00	0.100	5.40	5.65	0.25	4.00	2.00
					0.010	0.0050	1.00	0.100	5.65	5.85	0.20	3.00	
109		8.18	111.80	288.20	0.010	0.0050	1.00	0.100	4.40	4.65	0.25	4.00	2.00
					0.010	0.0050	1.00	0.100	4.65	4.85	0.20	3.00	
113	17	8.39	137.80	305.50	0.010	0.0050	1.00	0.100	8.25	8.50	0.25	4.00	2.00
					0.010	0.0050	1.00	0.100	8.50	8.70	0.20	3.00	
116		8.31	111.70	184.80	0.010	0.0050	1.00	0.100	1.55	1.75	0.20	3.00	1.50
					0.010	0.0050	1.00	0.100	1.75	1.95	0.20	3.00	
120	18	8.17	166.10	329.60	0.010	0.0050	1.00	0.100	2.05	2.25	0.20	3.00	1.50
					0.010	0.0050	1.00	0.100	2.25	2.40	0.15	2.00	
123		8.37	128.30	188.60	0.010	0.0050	1.00	0.100	3.95	4.45	0.50	9.00	4.50
					0.010	0.0050	1.00	0.100	4.65	4.85	0.20	3.00	
127	19	8.25	122.40	303.00	0.010	0.0050	1.00	0.100	2.95	3.15	0.20	3.00	1.50
					0.010	0.0050	1.00	0.100	3.15	3.35	0.20	3.00	
130		8.25	103.10	333.50	0.010	0.0050	1.00	0.100	5.70	5.90	0.20	3.00	1.50
					0.010	0.0050	1.00	0.100	5.90	6.10	0.20	3.00	
134	20	8.10	120.60	185.10	0.010	0.0050	1.00	0.100	2.00	2.20	0.20	3.00	1.50
					0.010	0.0050	1.00	0.100	2.20	2.40	0.20	3.00	
137		8.13	127.80	358.00	0.010	0.0050	1.00	0.100	5.15	5.35	0.20	3.00	1.50
					0.010	0.0050	1.00	0.100	5.35	5.55	0.20	3.00	
141	21	8.41	124.70	343.60	0.010	0.0050	1.00	0.100	4.25	4.45	0.20	3.00	1.50
					0.010	0.0050	1.00	0.100	4.45	4.65	0.20	3.00	
144		8.46	111.00	322.00	0.010	0.0050	1.00	0.100	3.70	3.90	0.20	3.00	1.50
					0.010	0.0050	1.00	0.100	3.90	4.10	0.20	3.00	

TKW-15

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	7.44	153.7	156.20	0.001	0.0005	5	0.00	0.00	10.60	10.60	1.62	1.68
					0.001	0.0005	5	0.00	0.00	11.20	11.20	1.74	
4		8.34	239.0	133.70	0.001	0.0005	10	0.00	13.80	15.20	1.40	-0.72	-0.70
					0.001	0.0005	10	0.00	12.20	13.80	1.60	-0.68	
8	2	8.38	268.0	131.80	0.010	0.0050	2	0.01	10.60	13.40	2.80	3.60	3.60
					0.010	0.0050	2	0.01	13.40	16.20	2.80	3.60	
11		8.27	194.3	170.20	0.010	0.0050	1	0.01	14.00	15.40	1.40	1.80	1.90
					0.010	0.0050	1	0.01	15.40	16.90	1.50	2.00	
15	3	8.15	211.0	112.50	0.010	0.0050	1	0.01	14.50	16.20	1.70	2.40	2.50
					0.010	0.0050	1	0.01	16.20	18.00	1.80	2.60	
18		7.72	179.0	88.20	0.010	0.0050	1	0.01	6.20	8.00	1.80	2.60	2.60
					0.010	0.0050	1	0.01	8.00	9.80	1.80	2.60	
22	4	8.66	181.0	149.90	0.010	0.0050	1	0.01	2.80	4.70	1.90	2.80	2.70
					0.010	0.0050	1	0.01	4.70	6.50	1.80	2.60	
25		8.40	279.0	213.70	0.010	0.0050	1	0.01	5.00	7.30	2.30	3.60	3.70
					0.010	0.0050	1	0.01	7.30	9.70	2.40	3.80	
29	5	7.88	338.0	153.00	0.010	0.0050	1	0.01	9.70	12.00	2.30	3.60	3.60
					0.010	0.0050	1	0.01	12.00	14.30	2.30	3.60	
32		7.77	258.0	299.00	0.010	0.0050	1	0.01	0.00	1.90	1.90	2.80	3.10
					0.010	0.0050	1	0.01	1.90	4.10	2.20	3.40	
36	6	7.46	312.0	125.00	0.010	0.0050	1	0.01	8.60	10.60	2.00	3.00	3.10
					0.010	0.0050	1	0.01	10.60	12.70	2.10	3.20	
39		8.27	259.0	142.10	0.010	0.0050	1	0.01	17.70	18.80	1.10	1.20	3.10
					0.010	0.0050	1	0.01	18.80	21.80	3.00	5.00	
43	7	8.23	297.0	215.80	0.010	0.0050	1	0.01	2.90	5.00	2.10	3.20	3.20
					0.010	0.0050	1	0.01	5.00	7.10	2.10	3.20	
46		8.33	217.0	182.90	0.010	0.0050	1	0.01	19.60	21.40	1.80	2.60	2.50
					0.010	0.0050	1	0.01	21.40	23.10	1.70	2.40	
50	8	8.14	275.0	312.70	0.010	0.0050	1	0.01	14.80	16.70	1.90	2.80	2.90
					0.010	0.0050	1	0.01	16.70	18.70	2.00	3.00	
53		8.37	251.0	240.40	0.010	0.0050	1	0.01	0.00	1.90	1.90	2.80	2.90
					0.010	0.0050	1	0.01	1.90	3.90	2.00	3.00	
57	9	8.14	325.0	263.50	0.010	0.0050	1	0.01	3.60	5.70	2.10	3.20	3.20
					0.010	0.0050	1	0.01	5.70	7.80	2.10	3.20	
60		7.45	264.0	308.30	0.010	0.0050	1	0.01	7.10	9.00	1.90	2.80	2.90
					0.010	0.0050	1	0.01	9.00	11.00	2.00	3.00	
64	10	7.67	1966.0	244.90	0.010	0.0050	1	0.01	0.00	2.00	2.00	3.00	2.90
					0.010	0.0050	1	0.01	2.00	3.90	1.90	2.80	
67		8.07	256.0	259.80	0.010	0.0050	1	0.01	8.30	9.20	0.90	0.80	2.80
					0.010	0.0050	1	0.01	9.20	12.10	2.90	4.80	
71	11	7.17	746.0	305.90	0.010	0.0050	1	0.01	1.50	3.50	2.00	3.00	3.20
					0.010	0.0050	1	0.01	3.50	5.70	2.20	3.40	
74		7.89	223.0	237.30	0.010	0.0050	1	0.01	13.40	15.30	1.90	2.80	2.90
					0.010	0.0050	1	0.01	15.30	17.30	2.00	3.00	

TKW-15

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	7.68	260.0	152.40	0.010	0.0050	1	0.01	12.20	14.20	2.00	3.00	3.00
					0.010	0.0050	1	0.01	14.20	16.20	2.00	3.00	
81		7.51	197.2	147.60	0.010	0.0050	1	0.10	4.70	4.95	0.25	4.00	3.50
					0.010	0.0050	1	0.10	4.95	5.15	0.20	3.00	
85	13	7.89	193.1	213.40	0.010	0.0050	1	0.10	1.40	1.60	0.20	3.00	3.00
					0.010	0.0050	1	0.10	1.60	1.80	0.20	3.00	
88		8.41	189.9	291.40	0.010	0.0050	1	0.10	1.45	1.70	0.25	4.00	4.00
					0.010	0.0050	1	0.10	1.70	1.95	0.25	4.00	
92	14	8.36	215.0	284.30	0.010	0.0050	1	0.10	2.50	2.70	0.20	3.00	3.00
					0.010	0.0050	1	0.10	2.70	2.90	0.20	3.00	
95		7.78	197.1	267.70	0.010	0.0050	1	0.10	4.05	4.30	0.25	4.00	3.50
					0.010	0.0050	1	0.10	4.30	4.50	0.20	3.00	
99	15	8.08	218.0	313.20	0.010	0.0050	1	0.10	7.00	7.20	0.20	3.00	3.00
					0.010	0.0050	1	0.10	7.20	7.40	0.20	3.00	
102		8.01	145.9	180.20	0.010	0.0050	1	0.10	1.75	2.00	0.25	4.00	4.00
					0.010	0.0050	1	0.10	2.00	2.25	0.25	4.00	
106	16	8.05	197.6	272.20	0.010	0.0050	1	0.10	4.60	4.80	0.20	3.00	3.50
					0.010	0.0050	1	0.10	4.80	5.05	0.25	4.00	
109		8.11	172.9	288.20	0.010	0.0050	1	0.10	5.25	5.50	0.25	4.00	3.50
					0.010	0.0050	1	0.10	5.50	5.70	0.20	3.00	
113	17	8.14	233.0	315.70	0.010	0.0050	1	0.10	7.05	7.25	0.20	3.00	3.00
					0.010	0.0050	1	0.10	7.25	7.45	0.20	3.00	
116		8.31	171.7	189.20	0.010	0.0050	1	0.10	4.45	4.65	0.20	3.00	3.50
					0.010	0.0050	1	0.10	4.65	4.90	0.25	4.00	
120	18	7.91	234.0	448.80	0.010	0.0050	1	0.10	0.00	0.15	0.15	2.00	3.50
					0.010	0.0050	1	0.10	0.15	0.45	0.30	5.00	
123		8.36	159.9	204.60	0.010	0.0050	1	0.10	7.70	7.90	0.20	3.00	3.00
					0.010	0.0050	1	0.10	7.90	8.10	0.20	3.00	
127	19	8.16	193.0	295.10	0.010	0.0050	1	0.10	5.55	5.80	0.25	4.00	3.50
					0.010	0.0050	1	0.10	5.80	6.00	0.20	3.00	
130		8.39	170.6	356.20	0.010	0.0050	1	0.10	1.55	1.75	0.20	3.00	3.50
					0.010	0.0050	1	0.10	1.75	2.00	0.25	4.00	
134	20	7.34	216.0	138.80	0.010	0.0050	1	0.10	0.40	0.60	0.20	3.00	3.50
					0.010	0.0050	1	0.10	0.60	0.85	0.25	4.00	
137		8.13	186.4	342.80	0.010	0.0050	1	0.10	6.30	6.50	0.20	3.00	3.50
					0.010	0.0050	1	0.10	6.50	6.75	0.25	4.00	
141	21	8.19	201.0	336.80	0.010	0.0050	1	0.10	5.85	6.10	0.25	4.00	4.00
					0.010	0.0050	1	0.10	6.10	6.35	0.25	4.00	
144		8.35	162.4	315.20	0.010	0.0050	1	0.10	5.90	6.20	0.30	5.00	4.00
					0.010	0.0050	1	0.10	6.20	6.40	0.20	3.00	

TKW-18

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	8.03	220.0	144.10	0.001	0.0005	5.0	0.001	0.00	4.40	4.40	0.38	0.36
					0.001	0.0005	5.0	0.001	0.00	4.20	4.20	0.34	
4		7.93	177.1	111.80	0.001	0.0005	10.0	0.001	8.10	9.60	1.50	-0.70	1.93
					0.001	0.0005	10.0	0.001	15.00	16.40	1.40	-0.72	
8	2	8.48	138.8	242.80	0.010	0.0050	2.0	0.010	0.00	2.70	2.70	3.40	3.50
					0.010	0.0050	2.0	0.010	2.70	5.50	2.80	3.60	
11		7.3	160.3	162.70	0.010	0.0050	1.5	0.010	0.00	1.00	1.00	0.50	0.70
					0.010	0.0050	1.5	0.010	1.00	2.20	1.20	0.90	
15	3	8.12	149.0	208.10	0.010	0.0050	1.0	0.010	11.90	13.20	1.30	1.60	1.60
					0.010	0.0050	1.0	0.010	13.20	14.50	1.30	1.60	
18		8.69	142.5	236.90	0.010	0.0050	1.0	0.010	17.60	19.10	1.50	2.00	2.20
					0.010	0.0050	1.0	0.010	19.10	20.80	1.70	2.40	
22	4	8.52	144.7	165.70	0.010	0.0050	1.0	0.010	10.00	11.40	1.40	1.80	6.20
					0.010	0.0050	1.0	0.010	5.60	11.40	5.80	10.60	
25		8.54	140.6	201.00	0.010	0.0050	1.0	0.010	3.90	5.40	1.50	2.00	1.80
					0.010	0.0050	1.0	0.010	5.40	6.70	1.30	1.60	
29	5	8.54	132.8	166.90	0.010	0.0050	1.0	0.010	14.30	15.80	1.50	2.00	1.70
					0.010	0.0050	1.0	0.010	15.80	17.00	1.20	1.40	
32		8.33	135.9	125.50	0.010	0.0050	1.0	0.010	7.30	8.50	1.20	1.40	1.50
					0.010	0.0050	1.0	0.010	8.50	9.80	1.30	1.60	
36	6	8.53	133.9	201.40	0.010	0.0050	1.0	0.010	2.90	4.20	1.30	1.60	1.50
					0.010	0.0050	1.0	0.010	4.20	5.40	1.20	1.40	
39		7.88	146.0	195.50	0.010	0.0050	1.0	0.010	0.00	1.30	1.30	1.60	1.70
					0.010	0.0050	1.0	0.010	1.30	2.70	1.40	1.80	
43	7	8.12	158.1	215.00	0.010	0.0050	1.0	0.010	7.10	8.40	1.30	1.60	1.70
					0.010	0.0050	1.0	0.010	8.40	9.80	1.40	1.80	
46		8.49	126.6	171.40	0.010	0.0050	1.0	0.010	6.10	7.50	1.40	1.80	1.80
					0.010	0.0050	1.0	0.010	7.50	8.90	1.40	1.80	
50	8	8.39	123.0	205.20	0.010	0.0050	1.0	0.010	12.20	13.50	1.30	1.60	1.90
					0.010	0.0050	1.0	0.010	13.50	15.10	1.60	2.20	
53		8.61	132.2	313.00	0.010	0.0050	1.0	0.010	15.50	17.20	1.70	2.40	2.30
					0.010	0.0050	1.0	0.010	17.20	18.80	1.60	2.20	
57	9	8.14	122.0	265.60	0.010	0.0050	1.0	0.010	7.80	9.60	1.80	2.60	2.50
					0.010	0.0050	1.0	0.010	9.60	11.30	1.70	2.40	
60		8.14	106.4	299.10	0.010	0.0050	1.0	0.010	18.90	20.70	1.80	2.60	2.70
					0.010	0.0050	1.0	0.010	20.70	22.60	1.90	2.80	
64	10	8.38	122.1	267.20	0.010	0.0050	1.0	0.010	3.90	5.80	1.90	2.80	2.60
					0.010	0.0050	1.0	0.010	5.80	7.50	1.70	2.40	
67		8.19	124.2	240.60	0.010	0.0050	1.0	0.010	4.30	6.20	1.90	2.80	3.00
					0.010	0.0050	1.0	0.010	6.20	8.30	2.10	3.20	
71	11	8.27	149.2	310.10	0.010	0.0050	1.0	0.010	21.10	23.20	2.10	3.20	2.90
					0.010	0.0050	1.0	0.010	14.50	16.30	1.80	2.60	
74		7.95	123.5	274.50	0.010	0.0050	1.0	0.010	0.00	1.90	1.90	2.80	1.40
					0.010	0.0050	1.0	0.010	1.90	3.90	2.00	3.00	

TKW-18

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	8.48	109.3	116.40	0.010	0.0050	1.0	0.010	17.10	18.90	1.80	2.60	1.30
					0.010	0.0050	1.0	0.010	18.90	20.80	1.90	2.80	
81		6.82	112.4	142.70	0.010	0.0050	1.0	0.100	4.30	4.45	0.15	2.00	1.00
					0.010	0.0050	1.0	0.100	4.45	4.70	0.25	4.00	
85	13	8.39	114.0	207.60	0.010	0.0050	1.0	0.100	0.00	0.25	0.25	4.00	2.00
					0.010	0.0050	1.0	0.100	0.25	0.50	0.25	4.00	
88		8.55	115.5	295.20	0.010	0.0050	1.0	0.100	1.95	2.20	0.25	4.00	2.00
					0.010	0.0050	1.0	0.100	2.20	2.40	0.20	3.00	
92	14	7.23	106.9	287.00	0.010	0.0050	1.0	0.100	4.75	5.00	0.25	4.00	2.00
					0.010	0.0050	1.0	0.100	5.00	5.20	0.20	3.00	
95		8.11	96.5	276.00	0.010	0.0050	1.0	0.100	4.90	5.05	0.15	2.00	1.00
					0.010	0.0050	1.0	0.100	5.05	5.30	0.25	4.00	
99	15	8.38	105.6	323.60	0.010	0.0050	1.0	0.100	6.65	6.80	0.15	2.00	1.00
					0.010	0.0050	1.0	0.100	6.80	7.00	0.20	3.00	
102		8.13	124.1	166.70	0.010	0.0050	1.0	0.100	2.25	2.40	0.15	2.00	1.00
					0.010	0.0050	1.0	0.100	2.40	2.60	0.20	3.00	
106	16	8.22	110.9	275.90	0.010	0.0050	1.0	0.100	4.25	4.40	0.15	2.00	1.00
					0.010	0.0050	1.0	0.100	4.40	4.60	0.20	3.00	
109		8.28	111.3	303.50	0.010	0.0050	1.0	0.100	1.25	1.50	0.25	4.00	2.00
					0.010	0.0050	1.0	0.100	1.50	1.70	0.20	3.00	
113	17	8.2	148.1	460.00	0.010	0.0050	1.0	0.100	3.05	3.30	0.25	4.00	2.00
					0.010	0.0050	1.0	0.100	3.30	3.55	0.25	4.00	
116		8.27	112.8	185.20	0.010	0.0050	1.0	0.100	2.80	3.00	0.20	3.00	1.50
					0.010	0.0050	1.0	0.100	3.00	3.20	0.20	3.00	
120	18	8.33	116.6	315.60	0.010	0.0050	1.0	0.100	3.75	3.95	0.20	3.00	1.50
					0.010	0.0050	1.0	0.100	3.95	4.15	0.20	3.00	
123		8.37	128.3	188.60	0.010	0.0050	1.0	0.100	3.95	4.20	0.25	4.00	2.00
					0.010	0.0050	1.0	0.100	4.20	4.45	0.25	4.00	
127	19	8.18	114.9	301.30	0.010	0.0050	1.0	0.100	4.00	4.20	0.20	3.00	1.50
					0.010	0.0050	1.0	0.100	4.20	4.40	0.20	3.00	
130		8.23	114.1	333.00	0.010	0.0050	1.0	0.100	5.30	5.50	0.20	3.00	1.50
					0.010	0.0050	1.0	0.100	5.50	5.70	0.20	3.00	
134	20	8.17	113.3	193.60	0.010	0.0050	1.0	0.100	3.65	3.85	0.20	3.00	1.50
					0.010	0.0050	1.0	0.100	3.85	4.05	0.20	3.00	
137		8.29	118.3	345.50	0.010	0.0050	1.0	0.100	6.75	6.90	0.15	2.00	1.00
					0.010	0.0050	1.0	0.100	6.90	7.10	0.20	3.00	
141	21	8.56	122.6	347.20	0.010	0.0050	1.0	0.100	2.75	2.95	0.20	3.00	1.50
					0.010	0.0050	1.0	0.100	2.95	3.15	0.20	3.00	
144		8.69	124.9	315.30	0.010	0.0050	1.0	0.100	2.50	2.65	0.15	2.00	1.00
					0.010	0.0050	1.0	0.100	2.65	2.80	0.15	2.00	

TKW-19

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	7.96	692.0	142.40	0.001	0.0005	6	0.00	0.00	7.10	7.10	0.82	0.82
					0.001	0.0005	6	0.00	11.00	18.10	7.10	0.82	
4		8.02	280.0	167.30	0.001	0.0005	10	0.00	15.20	16.90	1.70	-0.66	0.51
					0.001	0.0005	10	0.00	16.90	18.70	1.80	-0.64	
8	2	8.19	436.0	223.40	0.010	0.0050	2	0.01	2.20	3.30	1.10	0.20	0.20
					0.010	0.0050	2	0.01	3.30	4.40	1.10	0.20	
11		8.21	309.0	152.20	0.010	0.0050	1	0.01	5.50	8.10	2.60	4.20	4.10
					0.010	0.0050	1	0.01	8.10	10.60	2.50	4.00	
15	3	7.96	330.0	213.30	0.010	0.0050	1	0.01	3.40	4.50	1.10	1.20	1.30
					0.010	0.0050	1	0.01	4.50	5.70	1.20	1.40	
18		8.35	313.0	176.70	0.010	0.0050	1	0.01	0.00	1.20	1.20	1.40	1.60
					0.010	0.0050	1	0.01	1.20	2.60	1.40	1.80	
22	4	8.43	269.0	236.60	0.010	0.0050	1	0.01	10.00	11.40	1.40	1.80	1.90
					0.010	0.0050	1	0.01	11.40	12.90	1.50	2.00	
25		8.24	265.0	86.40	0.010	0.0050	1	0.01	9.80	11.40	1.60	2.20	2.00
					0.010	0.0050	1	0.01	11.40	12.80	1.40	1.80	
29	5	8.26	252.0	232.80	0.010	0.0050	1	0.01	14.60	16.10	1.50	2.00	2.00
					0.010	0.0050	1	0.01	16.10	17.60	1.50	2.00	
32		8.39	220.0	100.90	0.010	0.0050	1	0.01	13.00	14.40	1.40	1.80	1.70
					0.010	0.0050	1	0.01	14.40	15.70	1.30	1.60	
36	6	8.33	238.0	173.10	0.010	0.0050	1	0.01	13.60	14.80	1.20	1.40	1.70
					0.010	0.0050	1	0.01	14.80	16.30	1.50	2.00	
39		8.35	208.0	146.80	0.010	0.0050	1	0.01	13.00	14.30	1.30	1.60	1.70
					0.010	0.0050	1	0.01	14.30	15.70	1.40	1.80	
43	7	8.06	216.0	217.70	0.010	0.0050	1	0.01	18.20	19.50	1.30	1.60	1.70
					0.010	0.0050	1	0.01	19.50	20.90	1.40	1.80	
46		8.36	185.3	199.90	0.010	0.0050	1	0.01	15.10	16.30	1.20	1.40	1.60
					0.010	0.0050	1	0.01	16.30	17.70	1.40	1.80	
50	8	8.07	203.0	208.00	0.010	0.0050	1	0.01	21.50	22.90	1.40	1.80	1.80
					0.010	0.0050	1	0.01	22.90	24.30	1.40	1.80	
53		8.03	171.3	314.80	0.010	0.0050	1	0.01	5.00	6.70	1.70	2.40	0.70
					0.010	0.0050	1	0.01	0.00	0.00	0.00	-1.00	
57	9	8.30	201.0	263.00	0.010	0.0050	1	0.01	15.40	17.10	1.70	2.40	2.40
					0.010	0.0050	1	0.01	17.10	18.80	1.70	2.40	
60		8.10	185.4	271.10	0.010	0.0050	1	0.01	9.60	11.20	1.60	2.20	2.40
					0.010	0.0050	1	0.01	11.20	13.00	1.80	2.60	
64	10	7.93	182.7	196.10	0.010	0.0050	1	0.01	10.40	12.20	1.80	2.60	2.50
					0.010	0.0050	1	0.01	12.20	13.90	1.70	2.40	
67		6.82	176.1	280.10	0.010	0.0050	1	0.01	12.10	14.10	2.00	3.00	2.70
					0.010	0.0050	1	0.01	14.10	15.80	1.70	2.40	
71	11	7.94	239.0	309.90	0.010	0.0050	1	0.01	10.90	12.60	1.70	2.40	2.20
					0.010	0.0050	1	0.01	12.60	14.10	1.50	2.00	
74		8.14	173.5	240.80	0.010	0.0050	1	0.01	17.30	19.20	1.90	2.80	2.90
					0.010	0.0050	1	0.01	19.20	21.20	2.00	3.00	

TKW-19

Days	Cycle no.	pH	EC (µS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	8.37	179.9	126.50	0.010	0.0050	1	0.01	5.90	7.60	1.70	2.40	2.50
					0.010	0.0050	1	0.01	7.60	9.40	1.80	2.60	
81		8.23	179.3	130.70	0.010	0.0050	1	0.10	1.15	1.30	0.15	2.00	2.50
					0.010	0.0050	1	0.10	1.30	1.50	0.20	3.00	
85	13	8.44	198.9	207.90	0.010	0.0050	1	0.10	0.50	0.65	0.15	2.00	2.50
					0.010	0.0050	1	0.10	0.65	0.85	0.20	3.00	
88		8.50	159.2	255.30	0.010	0.0050	1	0.10	5.55	5.75	0.20	3.00	2.60
					0.010	0.0050	1	0.10	5.74	5.90	0.16	2.20	
92	14	8.43	155.8	141.80	0.010	0.0050	1	0.10	3.85	4.10	0.25	4.00	3.50
					0.010	0.0050	1	0.10	4.10	4.30	0.20	3.00	
95		8.07	161.2	272.70	0.010	0.0050	1	0.10	4.50	4.70	0.20	3.00	3.00
					0.010	0.0050	1	0.10	4.70	4.90	0.20	3.00	
99	15	8.25	153.4	332.20	0.010	0.0050	1	0.10	3.30	3.50	0.20	3.00	2.50
					0.010	0.0050	1	0.10	3.50	3.65	0.15	2.00	
102		8.26	155.3	167,7	0.010	0.0050	1	0.10	3.00	3.25	0.25	4.00	3.50
					0.010	0.0050	1	0.10	3.25	3.45	0.20	3.00	
106	16	8.11	157.5	273.10	0.010	0.0050	1	0.10	3.80	4.00	0.20	3.00	3.50
					0.010	0.0050	1	0.10	4.00	4.25	0.25	4.00	
109		8.10	147.0	301.70	0.010	0.0050	1	0.10	4.00	4.20	0.20	3.00	3.00
					0.010	0.0050	1	0.10	4.20	4.40	0.20	3.00	
113	17	8.37	172.3	319.20	0.010	0.0050	1	0.10	5.75	5.95	0.20	3.00	3.00
					0.010	0.0050	1	0.10	5.95	6.15	0.20	3.00	
116		8.44	150.7	186.60	0.010	0.0050	1	0.10	4.00	4.25	0.25	4.00	3.50
					0.010	0.0050	1	0.10	4.25	4.45	0.20	3.00	
120	18	8.17	166.1	329.60	0.010	0.0050	1	0.10	2.05	2.25	0.20	3.00	2.50
					0.010	0.0050	1	0.10	2.25	2.40	0.15	2.00	
123		8.40	148.8	214.80	0.010	0.0050	1	0.10	8.50	8.70	0.20	3.00	3.00
					0.010	0.0050	1	0.10	8.70	8.90	0.20	3.00	
127	19	8.03	177.6	333.10	0.010	0.0050	1	0.10	0.50	0.70	0.20	3.00	3.00
					0.010	0.0050	1	0.10	0.70	0.90	0.20	3.00	
130		8.08	144.1	336.40	0.010	0.0050	1	0.10	4.95	5.10	0.15	2.00	2.50
					0.010	0.0050	1	0.10	5.10	5.30	0.20	3.00	
134	20	8.10	157.5	198.40	0.010	0.0050	1	0.10	4.80	5.00	0.20	3.00	3.00
					0.010	0.0050	1	0.10	5.00	5.20	0.20	3.00	
137		8.41	164.0	338.20	0.010	0.0050	1	0.10	7.95	8.15	0.20	3.00	2.50
					0.010	0.0050	1	0.10	8.15	8.30	0.15	2.00	
141	21	8.40	154.8	359.00	0.010	0.0050	1	0.10	3.55	3.70	0.15	2.00	2.00
					0.010	0.0050	1	0.10	3.70	3.85	0.15	2.00	
144		8.50	138.2	318.90	0.010	0.0050	1	0.10	5.25	5.40	0.15	2.00	2.50
					0.010	0.0050	1	0.10	5.40	5.60	0.20	3.00	

TKW-22

Days	Cycle no.	pH	EC (µS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	6.33	3020.00	58.30	0.001	0.0005	2.50	0.00	12.90	13.80	0.90	-0.07	0.00
					0.001	0.0005	2.50	0.00	12.30	12.90	0.60	-0.13	
4		7.12	2280.00	101.00	0.001	0.0005	6.00	0.00	0.00	12.10	12.10	1.82	1.78
					0.001	0.0005	6.00	0.00	12.10	23.80	11.70	1.74	
8	2	6.64	2790.00	201.00	0.010	0.0050	3.00	0.01	15.00	19.40	4.40	5.80	5.70
					0.010	0.0050	3.00	0.01	19.40	23.70	4.30	5.60	
11		6.22	2080.00	191.20	0.010	0.0050	1.50	0.01	4.70	7.00	2.30	3.10	3.00
					0.010	0.0050	1.50	0.01	7.00	9.20	2.20	2.90	
15	3	7.56	1416.00	203.30	0.010	0.0050	1.00	0.01	15.10	16.90	1.80	2.60	2.50
					0.010	0.0050	1.00	0.01	16.90	18.60	1.70	2.40	
18		7.86	1091.00	183.50	0.010	0.0050	1.00	0.01	20.30	22.00	1.70	2.40	2.50
					0.010	0.0050	1.00	0.01	22.00	23.80	1.80	2.60	
22	4	6.23	747.00	174.10	0.010	0.0050	1.00	0.01	1.90	3.60	1.70	2.40	2.90
					0.010	0.0050	1.00	0.01	3.60	5.80	2.20	3.40	
25		7.68	274.00	194.90	0.010	0.0050	1.00	0.01	0.00	2.20	2.20	3.40	3.60
					0.010	0.0050	1.00	0.01	2.20	4.60	2.40	3.80	
29	5	6.92	138.10	163.20	0.010	0.0050	1.00	0.01	10.20	12.40	2.20	3.40	3.00
					0.010	0.0050	1.00	0.01	12.40	14.20	1.80	2.60	
32		5.95	102.70	151.90	0.010	0.0050	1.00	0.01	0.00	2.00	2.00	3.00	2.80
					0.010	0.0050	1.00	0.01	2.00	3.80	1.80	2.60	
36	6	7.59	108.00	352.80	0.010	0.0050	1.00	0.01	7.90	9.70	1.80	2.60	3.00
					0.010	0.0050	1.00	0.01	9.70	11.90	2.20	3.40	
39		7.73	82.60	481.10	0.010	0.0050	1.00	0.01	19.10	21.00	1.90	2.80	2.70
					0.010	0.0050	1.00	0.01	21.00	22.80	1.80	2.60	
43	7	6.65	93.00	152.40	0.010	0.0050	1.00	0.01	6.70	8.70	2.00	3.00	2.90
					0.010	0.0050	1.00	0.01	8.70	10.60	1.90	2.80	
46		7.95	56.20	397.60	0.010	0.0050	1.00	0.01	4.10	6.90	2.80	4.60	4.00
					0.010	0.0050	1.00	0.01	6.90	9.10	2.20	3.40	
50	8	7.47	93.40	176.70	0.010	0.0050	1.00	0.01	8.70	10.70	2.00	3.00	3.20
					0.010	0.0050	1.00	0.01	10.70	12.90	2.20	3.40	
53		7.62	77.60	263.10	0.010	0.0050	1.00	0.01	12.80	15.30	2.50	4.00	4.20
					0.010	0.0050	1.00	0.01	15.30	18.00	2.70	4.40	
57	9	6.99	76.30	250.10	0.010	0.0050	1.00	0.01	4.70	5.10	0.40	7.00	6.00
					0.010	0.0050	1.00	0.01	5.10	5.40	0.30	5.00	
60		7.51	66.70	304.10	0.010	0.0050	1.00	0.01	3.25	3.55	0.30	5.00	5.00
					0.010	0.0050	1.00	0.01	3.55	3.85	0.30	5.00	
64	10	7.76	51.60	163.50	0.010	0.0050	1.00	0.01	7.95	8.25	0.30	5.00	4.50
					0.010	0.0050	1.00	0.01	8.25	8.50	0.25	4.00	
67		6.82	86.80	121.90	0.010	0.0050	1.00	0.01	5.60	5.90	0.30	5.00	4.50
					0.010	0.0050	1.00	0.01	5.90	6.15	0.25	4.00	
71	11	7.60	184.40	154.70	0.010	0.0050	1.00	0.01	5.25	5.50	0.25	4.00	4.50
					0.010	0.0050	1.00	0.01	5.50	5.80	0.30	5.00	
74		8.14	65.50	173.10	0.010	0.0050	1.00	0.01	4.45	4.75	0.30	5.00	5.00
					0.010	0.0050	1.00	0.01	4.75	5.05	0.30	5.00	

TKW-22

Days	Cycle no.	pH	EC (µS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	5.92	94.00	131.70	0.010	0.0050	1.00	0.01	5.30	5.55	0.25	4.00	1.50
					0.010	0.0050	1.00	0.01	-	0.00	0.00	-1.00	
81		8.16	57.30	171.50	0.010	0.0050	1.00	0.10	5.20	5.60	0.40	7.00	5.50
					0.010	0.0050	1.00	0.10	5.30	5.85	0.25	4.00	
85	13	7.67	87.40	311.60	0.010	0.0050	1.00	0.10	4.90	5.2	0.30	5.00	5.00
					0.010	0.0050	1.00	0.10	5.20	5.5	0.30	5.00	
88		6.39	79.60	506.20	0.010	0.0050	1.00	0.10	4.90	5.15	0.25	4.00	4.50
					0.010	0.0050	1.00	0.10	5.15	5.45	0.30	5.00	
92	14	8.00	87.70	493.00	0.010	0.0050	1.00	0.10	1.80	2.25	0.45	8.00	10.00
					0.010	0.0050	1.00	0.10	2.25	2.90	0.65	12.00	
95		7.14	111.00	514.30	0.010	0.0050	1.00	0.10	4.20	4.80	0.60	11.00	7.50
					0.010	0.0050	1.00	0.10	4.80	5.05	0.25	4.00	
99	15	7.95	122.50	239.60	0.010	0.0050	11.00	0.10	2.10	2.40	0.30	5.00	4.50
					0.010	0.0050	1.00	0.10	2.40	2.65	0.25	4.00	
102		7.31	75.10	241.10	0.010	0.0050	1.00	0.10	4.35	4.60	0.25	4.00	4.00
					0.010	0.0050	1.00	0.10	4.60	4.85	0.25	4.00	
106	16	7.15	105.30	442.50	0.010	0.0050	1.00	0.10	4.75	5.20	0.45	8.00	8.00
					0.010	0.0050	1.00	0.10	5.20	5.65	0.45	8.00	
109		8.11	93.20	218.70	0.010	0.0050	1.00	0.10	4.60	4.90	0.30	5.00	5.00
					0.010	0.0050	1.00	0.10	4.90	5.20	0.30	5.00	
113	17	7.90	86.70	207.20	0.010	0.0050	1.00	0.10	5.25	5.55	0.30	5.00	5.50
					0.010	0.0050	1.00	0.10	5.15	5.5	0.35	6.00	
116		8.13	81.70	222.90	0.010	0.0050	1.00	0.10	5.50	5.75	0.25	4.00	4.50
					0.010	0.0050	1.00	0.10	4.95	5.25	0.30	5.00	
120	18	7.73	7.67	343.40	0.010	0.0050	1.00	0.10	5.25	5.45	0.20	3.00	4.00
					0.010	0.0050	1.00	0.10	7.60	7.9	0.30	5.00	
123		7.88	81.40	179.90	0.010	0.0050	1.00	0.10	7.90	8.15	0.25	4.00	4.00
					0.010	0.0050	1.00	0.10	4.75	5	0.25	4.00	
127	19	8.11	56.00	225.80	0.010	0.0050	1.00	0.10	5.00	5.3	0.30	5.00	4.50
					0.010	0.0050	1.00	0.10	4.50	4.75	0.25	4.00	
130		8.16	59.00	218.20	0.010	0.0050	1.00	0.10	4.75	5	0.25	4.00	2.50
					0.010	0.0050	1.00	0.10	5.40	5.5	0.10	1.00	
134	20	8.12	85.40	249.00	0.010	0.0050	1.00	0.10	5.54	5.75	0.21	3.20	4.10
					0.010	0.0050	1.00	0.10	5.35	5.65	0.30	5.00	
137		8.08	62.10	283.30	0.010	0.0050	1.00	0.10	5.65	5.95	0.30	5.00	4.50
					0.010	0.0050	1.00	0.10	5.30	5.55	0.25	4.00	
141	21	8.08	49.10	258.50	0.010	0.0050	1.00	0.10	5.55	5.85	0.30	5.00	4.50
					0.010	0.0050	1.00	0.10	5.05	5.3	0.25	4.00	
144		7.55	54.70	233.30	0.010	0.0050	1.00	0.10	5.30	5.58	0.28	4.60	4.60
					-	-	-	-	-	-	-	-	

TKW-23

Days	Cycle no.	pH	EC (µS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	2.89	578.00	293.00	0.001	0.0005	0	0.001	0.00	7.20	7.20	1.44	1.44
					0.001	0.0005	0	0.001	0.00	0.00	0.00	0.00	
4		3.16	2700.00	299.50	0.001	0.0005	0	0.001	16.40	24.80	8.40	1.68	1.54
					0.001	0.0005	0	0.001	6.40	13.40	7.00	1.40	
8	2	3.07	2350.00	309.00	0.010	0.0050	0	0.010	6.50	12.90	6.40	12.80	12.80
					0.010	0.0050	0	0.010	0.00	0.00	0.00	0.00	
11		3.03	99.10	111.50	0.010	0.0050	0	0.010	5.50	8.10	2.60	5.20	7.30
					0.010	0.0050	0	0.010	0.00	4.70	4.70	9.40	
15	3	2.96	1031.00	97.40	0.010	0.0050	0	0.010	1.30	6.40	5.10	10.20	10.23
					0.010	0.0050	0	0.010	6.47	11.60	5.13	10.26	
18		3.28	2014.00	178.90	0.010	0.0050	1	0.010	0.00	3.40	3.40	5.80	5.70
					0.010	0.0050	1	0.010	3.40	6.70	3.30	5.60	
22	4	3.33	691.00	350.70	0.010	0.0050	1	0.010	0.00	2.90	2.90	4.80	4.60
					0.010	0.0050	1	0.010	2.90	5.60	2.70	4.40	
25		3.36	2100.00	298.40	0.010	0.0050	1	0.010	0.00	2.50	2.50	4.00	4.00
					0.010	0.0050	1	0.010	2.50	5.00	2.50	4.00	
29	5	3.35	612.00	372.00	0.010	0.0050	1	0.010	8.40	10.60	2.20	3.40	3.40
					0.010	0.0050	1	0.010	10.60	12.80	2.20	3.40	
32		3.42	568.00	345.50	0.010	0.0050	1	0.010	0.00	2.00	2.00	3.00	3.20
					0.010	0.0050	1	0.010	2.00	4.20	2.20	3.40	
36	6	3.38	559.00	453.20	0.010	0.0050	1	0.010	4.00	6.00	2.00	3.00	3.10
					0.010	0.0050	1	0.010	6.00	8.10	2.10	3.20	
39		3.14	504.00	311.70	0.010	0.0050	1	0.010	8.90	10.90	2.00	3.00	2.80
					0.010	0.0050	1	0.010	10.90	12.70	1.80	2.60	
43	7	3.46	1261.00	304.10	0.010	0.0050	1	0.010	20.90	22.70	1.80	2.60	2.50
					0.010	0.0050	1	0.010	22.70	24.40	1.70	2.40	
46		3.43	445.00	311.70	0.010	0.0050	1	0.010	12.80	14.30	1.50	2.00	2.10
					0.010	0.0050	1	0.010	14.30	15.90	1.60	2.20	
50	8	3.45	451.00	325.30	0.010	0.0050	1	0.010	17.80	20.40	2.60	4.20	3.20
					0.010	0.0050	1	0.010	20.40	22.00	1.60	2.20	
53		3.47	420.00	372.70	0.010	0.0050	1	0.010	10.50	11.90	1.40	1.80	2.00
					0.010	0.0050	1	0.010	11.90	13.50	1.60	2.20	
57	9	3.49	397.00	176.70	0.010	0.0050	1	0.010	14.40	16.00	1.60	2.20	2.00
					0.010	0.0050	1	0.010	16.00	17.40	1.40	1.80	
60		3.52	398.00	349.30	0.010	0.0050	1	0.010	16.80	18.10	1.30	1.60	1.70
					0.010	0.0050	1	0.010	18.10	19.50	1.40	1.80	
64	10	3.52	337.00	354.80	0.010	0.0050	1	0.010	13.20	14.60	1.40	1.80	1.60
					0.010	0.0050	1	0.010	14.60	15.80	1.20	1.40	
67		3.55	339.00	388.10	0.010	0.0050	1	0.010	18.30	20.00	1.70	2.40	1.90
					0.010	0.0050	1	0.010	20.00	21.20	1.20	1.40	
71	11	4.26	558.00	374.40	0.010	0.0050	1	0.010	5.70	9.10	3.40	5.80	5.60
					0.010	0.0050	1	0.010	9.10	12.30	3.20	5.40	
74		3.74	338.00	360.10	0.010	0.0050	1	0.010	11.20	12.40	1.20	1.40	1.50
					0.010	0.0050	1	0.010	12.40	13.70	1.30	1.60	

TKW-23

Days	Cycle no.	pH	EC (µS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	3.67	317.00	355.00	0.010	0.0050	1	0.010	17.60	19.10	1.50	2.00	1.70
					0.010	0.0050	1	0.010	19.10	20.30	1.20	1.40	
81		3.52	299.00	270.20	0.010	0.0050	1	0.100	5.60	5.70	0.10	1.00	2.00
					0.010	0.0050	1	0.100	5.70	5.90	0.20	3.00	
85	13	3.6	316	353.8	0.010	0.0050	1	0.100	6.4	6.6	0.20	3.00	2.50
					0.010	0.0050	1	0.100	6.6	6.75	0.15	2.00	
88		3.66	310.00	378.00	0.010	0.0050	1	0.100	5.90	6.15	0.25	4.00	3.00
					0.010	0.0050	1	0.100	6.15	6.30	0.15	2.00	
92	14	3.59		305.00	0.010	0.0050	1	0.100	6.15	6.35	0.20	3.00	2.50
					0.010	0.0050	1	0.100	6.35	6.50	0.15	2.00	
95		3.46	282.00	361.90	0.010	0.0050	1	0.100	5.70	5.95	0.25	4.00	3.00
					0.010	0.0050	1	0.100	5.95	6.10	0.15	2.00	
99	15	3.44	243.00	374.30	0.010	0.0050	1	0.100	7.40	7.55	0.15	2.00	2.00
					0.010	0.0050	1	0.100	7.55	7.70	0.15	2.00	
102		3.57	280.00	419.20	0.010	0.0050	1	0.100	5.90	6.05	0.15	2.00	2.00
					0.010	0.0050	1	0.100	6.05	6.20	0.15	2.00	
106	16	3.26	263.00	464.10	0.010	0.0050	1	0.100	5.85	6.50	0.65	12.00	7.00
					0.010	0.0050	1	0.100	6.00	6.15	0.15	2.00	
109		3.45	269.00	384.20	0.010	0.0050	1	0.100	6.00	6.25	0.25	4.00	4.00
					0.010	0.0050	1	0.100	6.25	6.50	0.25	4.00	
113	17	3.45	260.00	376.60	0.010	0.0050	1	0.100	9.15	9.30	0.15	2.00	3.50
					0.010	0.0050	1	0.100	9.30	9.60	0.30	5.00	
116		3.45	231.00	248.70	0.010	0.0050	1	0.100	6.25	6.35	0.10	1.00	1.50
					0.010	0.0050	1	0.100	6.35	6.50	0.15	2.00	
120	18	3.46	246.00	386.90	0.010	0.0050	1	0.100	6.05	6.20	0.15	2.00	2.00
					0.010	0.0050	1	0.100	6.20	6.35	0.15	2.00	
123		3.52	227.00	322.10	0.010	0.0050	1	0.100	9.40	9.55	0.15	2.00	1.50
					0.010	0.0050	1	0.100	9.55	9.65	0.10	1.00	
127	19	3.85	250.00	461.60	0.010	0.0050	1	0.100	3.75	3.85	0.10	1.00	1.50
					0.010	0.0050	1	0.100	3.85	4.00	0.15	2.00	
130		3.45	198.60	387.10	0.010	0.0050	1	0.100	6.65	6.80	0.15	2.00	1.50
					0.010	0.0050	1	0.100	6.80	6.90	0.10	1.00	
134	20	3.43	208.00	349.00	0.010	0.0050	1	0.100	5.70	5.85	0.15	2.00	1.50
					0.010	0.0050	1	0.100	5.85	5.95	0.10	1.00	
137		3.61	234.00	379.10	0.010	0.0050	1	0.100	-	-	-	-	-
					0.010	0.0050	1	0.100	-	-	-	-	
141	21	3.65	201.00	388.10	0.010	0.0050	1	0.100	8.1	8.25	0.15	2.00	1.50
					0.010	0.0050	1	0.100	8.25	8.35	0.10	1.00	
144		3.82	175.50	376.50	0.010	0.0050	1	0.100	7.80	7.95	0.15	2.00	2.00
					0.010	0.0050	1	0.100	7.95	8.10	0.15	2.00	

TKW-25

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	8.35	385.00	65.40	0.001	0.0005	6.5	0.001	8.40	9.10	0.70	-0.51	-0.52
					0.001	0.0005	6.5	0.001	7.80	8.40	0.60	-0.53	
4		8.36	289.00	177.10	0.001	0.0005	8	0.001	0.00	5.20	5.20	0.24	0.30
					0.001	0.0005	8	0.001	6.00	11.80	5.80	0.36	
8	2	8.22	201.00	449.40	0.01	0.005	3	0.01	0.00	3.70	3.70	4.40	4.60
					0.01	0.005	3	0.01	3.70	7.60	3.90	4.80	
11		8.14	196.70	58.30	0.01	0.005	1.5	0.01	4.00	5.80	1.80	2.10	2.20
					0.01	0.005	1.5	0.01	5.80	7.70	1.90	2.30	
15	3	7.92	145.60	112.10	0.01	0.005	1	0.01	8.80	10.10	1.30	1.60	1.50
					0.01	0.005	1	0.01	10.10	11.30	1.20	1.40	
18		7.92	144.90	142.60	0.01	0.005	1	0.01	0.00	1.00	1.00	1.00	1.20
					0.01	0.005	1	0.01	1.00	2.20	1.20	1.40	
22	4	8.08	139.80	102.30	0.01	0.005	1	0.01	0.00	1.30	1.30	1.60	1.90
					0.01	0.005	1	0.01	1.30	2.90	1.60	2.20	
25		8.11	111.70	90.20	0.01	0.005	1	0.01	0.00	1.50	1.50	2.00	2.20
					0.01	0.005	1	0.01	1.50	3.20	1.70	2.40	
29	5	7.86	135.30	86.40	0.01	0.005	1	0.01	14.20	15.80	1.60	2.20	2.00
					0.01	0.005	1	0.01	15.80	17.20	1.40	1.80	
32		8.19	129.50	228.60	0.01	0.005	1	0.01	5.30	6.80	1.50	2.00	1.70
					0.01	0.005	1	0.01	6.80	8.00	1.20	1.40	
36	6	8.47	119.30	222.80	0.01	0.005	1	0.01	5.20	6.50	1.30	1.60	1.70
					0.01	0.005	1	0.01	6.50	7.90	1.40	1.80	
39		8.30	122.10	207.10	0.01	0.005	1	0.01	18.70	20.10	1.40	1.80	1.90
					0.01	0.005	1	0.01	20.10	21.60	1.50	2.00	
43	7	8.25	136.50	155.30	0.01	0.005	1	0.01	0.00	1.30	1.30	1.60	1.80
					0.01	0.005	1	0.01	1.30	2.80	1.50	2.00	
46		7.93	133.40	228.10	0.01	0.005	1	0.01	10.70	12.30	1.60	2.20	2.00
					0.01	0.005	1	0.01	12.30	13.70	1.40	1.80	
50	8	8.18	135.10	236.10	0.01	0.005	1	0.01	17.50	18.70	1.20	1.40	1.80
					0.01	0.005	1	0.01	18.70	20.30	1.60	2.20	
53		8.32	142.50	283.70	0.01	0.005	1	0.01	18.00	20.00	2.00	3.00	3.00
					0.01	0.005	1	0.01	20.00	22.00	2.00	3.00	
57	9	8.05	123.50	235.20	0.01	0.005	1	0.1	4.20	4.40	0.20	3.00	4.00
					0.01	0.005	1	0.1	4.40	4.70	0.30	5.00	
60		8.38	123.60	269.70	0.01	0.005	1	0.1	4.85	5.00	0.15	2.00	2.50
					0.01	0.005	1	0.1	5.00	5.20	0.20	3.00	
64	10	8.08	97.10	156.60	0.01	0.005	1	0.1	3.60	3.75	0.15	2.00	3.00
					0.01	0.005	1	0.1	3.75	4.00	0.25	4.00	
67		8.20	125.50	206.20	0.01	0.005	1	0.1	3.55	3.75	0.20	3.00	3.00
					0.01	0.005	1	0.1	3.75	3.95	0.20	3.00	
71	11	8.46	145.00	240.40	0.01	0.005	1	0.1	3.25	3.45	0.20	3.00	3.50
					0.01	0.005	1	0.1	3.45	3.70	0.25	4.00	
74		8.08	120.50	171.10	0.01	0.005	1	0.1	0.40	0.60	0.20	3.00	3.50
					0.01	0.005	1	0.1	0.60	0.85	0.25	4.00	

TKW-25

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	8.21	137.80	123.40	0.01	0.005	1	0.1	2.40	2.65	0.25	4.00	3.50
					0.01	0.005	1	0.1	2.65	2.85	0.20	3.00	
81		8.37	119.60	150.60	0.01	0.005	1	0.1	2.15	2.35	0.20	3.00	13.00
					0.01	0.005	1	0.1	2.35	3.55	1.20	23.00	
85	13	8.1	134.8	481.6	0.01	0.005	1	0.1	1.25	1.40	0.15	2.00	2.50
					0.01	0.005	1	0.1	1.40	1.60	0.20	3.00	
88		8.53	138.80	174.20	0.01	0.005	1	0.1	0.85	1.05	0.20	3.00	3.50
					0.01	0.005	1	0.1	1.05	1.30	0.25	4.00	
92	14	8.40	124.10	273.00	0.01	0.005	1	0.1	3.85	4.05	0.20	3.00	3.50
					0.01	0.005	1	0.1	4.05	4.30	0.25	4.00	
95		8.50	110.60	149.40	0.01	0.005	1	0.1	2.60	2.75	0.15	2.00	3.00
					0.01	0.005	1	0.1	2.75	3.00	0.25	4.00	
99	15	8.06	130.80	206.90	0.01	0.005	1	0.1	0.90	1.10	0.20	3.00	3.00
					0.01	0.005	1	0.1	1.10	1.30	0.20	3.00	
102		8.37	123.60	298.80	0.01	0.005	1	0.1	0.45	0.60	0.15	2.00	2.50
					0.01	0.005	1	0.1	0.60	0.80	0.20	3.00	
106	16	7.58	121.30	213.30	0.01	0.005	1	0.1	2.25	2.45	0.20	3.00	2.50
					0.01	0.005	1	0.1	2.45	2.60	0.15	2.00	
109		7.91	111.20	219.00	0.01	0.005	1	0.1	0.70	0.95	0.25	4.00	3.00
					0.01	0.005	1	0.1	0.95	1.10	0.15	2.00	
113	17	8.21	118.10	191.30	0.01	0.005	1	0.1	4.05	4.25	0.20	3.00	3.50
					0.01	0.005	1	0.1	4.25	4.50	0.25	4.00	
116		8.41	55.50	200.00	0.01	0.005	1	0.1	2.65	2.85	0.20	3.00	3.50
					0.01	0.005	1	0.1	2.85	3.10	0.25	4.00	
120	18	8.15	114.10	236.20	0.01	0.005	1	0.1	1.80	2.00	0.20	3.00	3.50
					0.01	0.005	1	0.1	2.00	2.25	0.25	4.00	
123		8.00	121.80	184.30	0.01	0.005	1	0.1	2.00	2.20	0.20	3.00	3.00
					0.01	0.005	1	0.1	2.20	2.40	0.20	3.00	
127	19	8.30	116.60	219.60	0.01	0.005	1	0.1	3.90	4.10	0.20	3.00	3.00
					0.01	0.005	1	0.1	4.10	4.30	0.20	3.00	
130		8.17	70.40	205.30	0.01	0.005	1	0.1	4.05	4.25	0.20	3.00	3.50
					0.01	0.005	1	0.1	4.25	4.50	0.25	4.00	
134	20	8.37	119.10	208.00	0.01	0.005	1	0.1	3.00	3.20	0.20	3.00	3.00
					0.01	0.005	1	0.1	3.20	3.40	0.20	3.00	
137		8.65	61.10	328.80	0.01	0.005	1	0.1	0.45	0.75	0.30	5.00	4.50
					0.01	0.005	1	0.1	0.75	1.00	0.25	4.00	
141	21	8.21	105.30	260.30	0.01	0.005	1	0.1	3.15	3.30	0.15	2.00	2.50
					0.01	0.005	1	0.1	3.30	3.50	0.20	3.00	
144		7.81	132.10	217.50	0.01	0.005	1	0.1	0.00	0.15	0.15	2.00	2.00
					-	-	-	-	-	-	-	-	

TKW-26

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	8.17	515.00	144.20	0.001	0.0005	5	0.001	0.00	5.60	5.60	0.62	0.60
					0.001	0.0005	5	0.001	0.00	5.40	5.40	0.58	
4		7.99	339.00	167.30	0.001	0.0005	10	0.001	5.00	6.60	1.60	-0.68	1.75
					0.001	0.0005	10	0.001	6.60	8.10	1.50	-0.70	
8	2	7.07	199.80	206.90	0.010	0.0050	2	0.010	0.00	2.50	2.50	3.00	2.90
					0.010	0.0050	2	0.010	2.50	4.90	2.40	2.80	
11		8.21	161.40	170.80	0.010	0.0050	1	0.010	10.90	11.40	0.50	0.00	0.60
					0.010	0.0050	1	0.010	11.40	12.50	1.10	1.20	
15	3	7.92	141.30	195.90	0.010	0.0050	1	0.010	7.40	8.70	1.30	1.60	1.60
					0.010	0.0050	1	0.010	8.70	10.00	1.30	1.60	
18		8.15	144.00	195.95	0.010	0.0050	1	0.010	12.90	14.50	1.60	2.20	2.10
					0.010	0.0050	1	0.010	14.50	16.00	1.50	2.00	
22	4	8.73	127.50	196.00	0.010	0.0050	1	0.010	6.50	8.30	1.80	2.60	2.50
					0.010	0.0050	1	0.010	8.30	10.00	1.70	2.40	
25		8.51	190.70	221.80	0.010	0.0050	1	0.010	12.30	14.00	1.70	2.40	2.40
					0.010	0.0050	1	0.010	14.00	15.70	1.70	2.40	
29	5	8.49	128.30	173.00	0.010	0.0050	1	0.010	3.20	4.60	1.40	1.80	1.80
					0.010	0.0050	1	0.010	4.60	6.00	1.40	1.80	
32		7.67	133.40	76.20	0.010	0.0050	1	0.010	12.70	14.10	1.40	1.80	1.40
					0.010	0.0050	1	0.010	14.10	15.10	1.00	1.00	
36	6	8.29	135.70	152.60	0.010	0.0050	1	0.010	12.70	14.10	1.40	1.80	1.70
					0.010	0.0050	1	0.010	14.10	15.40	1.30	1.60	
39		8.34	137.00	182.20	0.010	0.0050	1	0.010	14.90	16.30	1.40	1.80	1.80
					0.010	0.0050	1	0.010	16.30	17.70	1.40	1.80	
43	7	8.51	128.30	395.60	0.010	0.0050	1	0.010	2.60	4.10	1.50	2.00	2.00
					0.010	0.0050	1	0.010	4.10	5.60	1.50	2.00	
46		8.53	121.00	141.30	0.010	0.0050	1	0.010	17.70	19.20	1.50	2.00	2.00
					0.010	0.0050	1	0.010	19.20	20.70	1.50	2.00	
50	8	8.39	125.40	229.70	0.010	0.0050	1	0.010	3.20	4.70	1.50	2.00	2.10
					0.010	0.0050	1	0.010	4.70	6.30	1.60	2.20	
53		7.82	122.50	320.60	0.010	0.0050	1	0.010	7.50	9.30	1.80	2.60	2.70
					0.010	0.0050	1	0.010	9.30	11.20	1.90	2.80	
57	9	8.44	131.00	214.90	0.010	0.0050	1	0.010	4.80	6.60	1.80	2.60	2.60
					0.010	0.0050	1	0.010	6.60	8.40	1.80	2.60	
60		8.23	127.80	179.20	0.010	0.0050	1	0.010	3.90	5.60	1.70	2.40	2.60
					0.010	0.0050	1	0.010	5.60	7.50	1.90	2.80	
64	10	7.02	120.70	268.60	0.010	0.0050	1	0.010	18.00	19.80	1.80	2.60	2.60
					0.010	0.0050	1	0.010	19.80	21.60	1.80	2.60	
67		8.24	140.60	248.90	0.010	0.0050	1	0.010	10.60	12.30	1.70	2.40	2.40
					0.010	0.0050	1	0.010	12.30	14.00	1.70	2.40	
71	11	8.33	257.00	296.20	0.010	0.0050	1	0.010	11.60	13.40	1.80	2.60	2.60
					0.010	0.0050	1	0.010	13.40	15.20	1.80	2.60	
74		8.37	120.90	258.50	0.010	0.0050	1	0.010	3.70	5.50	1.80	2.60	2.60
					0.010	0.0050	1	0.010	5.50	7.30	1.80	2.60	

TKW-26

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	8.44	129.40	136.60	0.010	0.0050	1	0.010	13.40	15.40	2.00	3.00	2.70
					0.010	0.0050	1	0.010	15.40	17.10	1.70	2.40	
81		8.02	121.00	139.60	0.010	0.0050	1	0.100	0.65	0.90	0.25	4.00	5.00
					0.010	0.0050	1	0.100	0.90	1.25	0.35	6.00	
85	13	7.80	119.30	159.10	0.010	0.0050	1	0.100	2.70	2.90	0.20	3.00	2.50
					0.010	0.0050	1	0.100	2.90	3.05	0.15	2.00	
88		7.64	223.00	198.20	0.010	0.0050	1	0.100	3.65	3.85	0.20	3.00	3.50
					0.010	0.0050	1	0.100	3.85	4.10	0.25	4.00	
92	14	8.18	123.00	288.90	0.010	0.0050	1	0.100	3.55	3.75	0.20	3.00	3.00
					0.010	0.0050	1	0.100	3.75	3.95	0.20	3.00	
95		8.10	119.80	280.90	0.010	0.0050	1	0.100	1.15	1.35	0.20	3.00	3.00
					0.010	0.0050	1	0.100	1.35	1.55	0.20	3.00	
99	15	7.73	110.70	328.40	0.010	0.0050	1	0.100	2.45	2.65	0.20	3.00	3.00
					0.010	0.0050	1	0.100	2.65	2.85	0.20	3.00	
102		8.54	140.20	175.60	0.010	0.0050	1	0.100	0.00	0.30	0.30	5.00	4.00
					0.010	0.0050	1	0.100	0.30	0.50	0.20	3.00	
106	16	7.99	118.90	287.80	0.010	0.0050	1	0.100	2.55	2.75	0.20	3.00	3.00
					0.010	0.0050	1	0.100	2.75	2.95	0.20	3.00	
109		8.06	137.60	277.70	0.010	0.0050	1	0.100	0.00	0.20	0.20	3.00	3.00
					0.010	0.0050	1	0.100	0.20	0.40	0.20	3.00	
113	17	8.31	126.00	323.20	0.010	0.0050	1	0.100	4.45	4.65	0.20	3.00	3.50
					0.010	0.0050	1	0.100	4.65	4.90	0.25	4.00	
116		8.37	88.70	182.80	0.010	0.0050	1	0.100	1.05	1.30	0.25	4.00	4.00
					0.010	0.0050	1	0.100	1.30	1.55	0.25	4.00	
120	18	8.44	85.40	318.90	0.010	0.0050	1	0.100	2.40	2.65	0.25	4.00	3.50
					0.010	0.0050	1	0.100	2.65	2.85	0.20	3.00	
123		8.53	103.00	148.30	0.010	0.0050	1	0.100	3.55	3.75	0.20	3.00	3.00
					0.010	0.0050	1	0.100	3.75	3.95	0.20	3.00	
127	19	8.42	86.90	294.40	0.010	0.0050	1	0.100	4.40	4.60	0.20	3.00	3.00
					0.010	0.0050	1	0.100	4.60	4.80	0.20	3.00	
130		8.67	96.50	352.70	0.010	0.0050	1	0.100	1.15	1.35	0.20	3.00	3.00
					0.010	0.0050	1	0.100	1.35	1.55	0.20	3.00	
134	20	8.12	82.30	187.80	0.010	0.0050	1	0.100	2.85	3.10	0.25	4.00	3.00
					0.010	0.0050	1	0.100	3.10	3.25	0.15	2.00	
137		8.62	108.40	328.30	0.010	0.0050	1	0.100	8.70	8.90	0.20	3.00	3.00
					0.010	0.0050	1	0.100	8.90	9.10	0.20	3.00	
141	21	8.19	84.10	351.00	0.010	0.0050	1	0.100	3.85	4.05	0.20	3.00	3.00
					0.010	0.0050	1	0.100	4.05	4.25	0.20	3.00	
144		8.78	73.50	313.60	0.010	0.0050	1	0.100	6.80	7.05	0.25	4.00	4.00
					-	-	-	-	-	-	-	-	

TKW-27

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	7.83	1309.00	162.70	0.001	0.0005	7.5	0.001	0.00	7.10	7.10	0.67	0.67
					0.001	0.0005	7.5	0.001	11.00	18.10	7.10	0.67	
4		7.91	485.00	182.30	0.001	0.0005	10.0	0.001	8.30	10.20	1.90	-0.62	-0.61
					0.001	0.0005	10.0	0.001	10.20	12.20	2.00	-0.60	
8	2	8.12	409.00	167.10	0.010	0.0050	2.0	0.010	2.50	5.50	3.00	4.00	4.20
					0.010	0.0050	2.0	0.010	5.50	8.70	3.20	4.40	
11		8.13	311.00	166.20	0.010	0.0050	1.0	0.010	10.60	12.20	1.60	2.20	2.40
					0.010	0.0050	1.0	0.010	12.20	14.00	1.80	2.60	
15	3	7.72	330.00	119.90	0.010	0.0050	1.0	0.010	3.80	5.60	1.80	2.60	2.60
					0.010	0.0050	1.0	0.010	5.60	7.40	1.80	2.60	
18		7.98	248.00	228.10	0.010	0.0050	1.0	0.010	2.60	4.20	1.60	2.20	2.80
					0.010	0.0050	1.0	0.010	4.20	6.40	2.20	3.40	
22	4	8.30	293.00	126.00	0.010	0.0050	1.0	0.010	7.30	9.30	2.00	3.00	3.10
					0.010	0.0050	1.0	0.010	9.30	11.40	2.10	3.20	
25		8.53	238.00	170.80	0.010	0.0050	1.0	0.010	12.80	15.00	2.20	3.40	3.20
					0.010	0.0050	1.0	0.010	15.00	17.00	2.00	3.00	
29	5	7.85	289.00	226.20	0.010	0.0050	1.0	0.010	10.60	12.50	1.90	2.80	3.00
					0.010	0.0050	1.0	0.010	12.50	14.60	2.10	3.20	
32		8.34	236.00	161.80	0.010	0.0050	1.0	0.010	4.10	5.60	1.50	2.00	2.20
					0.010	0.0050	1.0	0.010	5.60	7.30	1.70	2.40	
36	6	8.18	307.00	198.00	0.010	0.0050	1.0	0.010	5.60	7.00	1.40	1.80	2.00
					0.010	0.0050	1.0	0.010	7.00	8.60	1.60	2.20	
39		8.28	252.00	194.40	0.010	0.0050	1.0	0.010	15.70	17.20	1.50	2.00	2.20
					0.010	0.0050	1.0	0.010	17.20	18.90	1.70	2.40	
43	7	8.06	287.00	219.20	0.010	0.0050	1.0	0.010	5.60	7.40	1.80	2.60	2.50
					0.010	0.0050	1.0	0.010	7.40	9.10	1.70	2.40	
46		7.92	210.00	187.60	0.010	0.0050	1.0	0.010	13.30	14.90	1.60	2.20	2.20
					0.010	0.0050	1.0	0.010	14.90	16.50	1.60	2.20	
50	8	8.04	240.00	208.40	0.010	0.0050	1.0	0.010	9.60	11.40	1.80	2.60	0.80
					0.010	0.0050	1.0	0.010	0.00	0.00	0.00	-1.00	
53		7.66	186.10	325.40	0.010	0.0050	1.0	0.010	3.30	5.50	2.20	3.40	3.50
					0.010	0.0050	1.0	0.010	5.50	7.80	2.30	3.60	
57	9	7.72	230.00	218.50	0.010	0.0050	1.0	0.010	18.80	21.00	2.20	3.40	3.20
					0.010	0.0050	1.0	0.010	21.00	23.00	2.00	3.00	
60		7.74	183.90	171.30	0.010	0.0050	1.0	0.010	14.50	16.70	2.20	3.40	3.40
					0.010	0.0050	1.0	0.010	16.70	18.90	2.20	3.40	
64	10	8.17	213.00	266.30	0.010	0.0050	1.0	0.010	18.40	20.50	2.10	3.20	3.20
					0.010	0.0050	1.0	0.010	-	-	-	-	
67		7.31	153.40	283.80	0.010	0.0050	1.0	0.010	20.30	22.80	2.50	4.00	3.60
					0.010	0.0050	1.0	0.010	7.90	10.00	2.10	3.20	
71	11	8.07	347.00	295.30	0.010	0.0050	1.0	0.010	2.10	4.40	2.30	3.60	3.50
					0.010	0.0050	1.0	0.010	4.40	6.60	2.20	3.40	
74		8.10	133.20	506.00	0.010	0.0050	1.0	0.010	21.20	23.70	2.50	4.00	3.80
					0.010	0.0050	1.0	0.010	1.40	3.70	2.30	3.60	

TKW-27

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	8.02	121.00	139.60	0.010	0.0050	1.0	0.100	0.65	0.90	0.25	4.00	5.00
					0.010	0.0050	1.0	0.100	0.90	1.25	0.35	6.00	
81		-	-	-	0.010	0.0050	1.0	0.100	-	-	-	-	-
					0.010	0.0050	1.0	0.100	-	-	-	-	
85	13	5.81	134.60	213.10	0.010	0.0050	1.0	0.100	1.80	2.05	0.25	4.00	4.00
					0.010	0.0050	1.0	0.100	2.05	2.30	0.25	4.00	
88		8.29	106.80	301.00	0.010	0.0050	1.0	0.100	4.55	4.80	0.25	4.00	4.00
					0.010	0.0050	1.0	0.100	4.80	5.05	0.25	4.00	
92	14	8.15	129.10	139.40	0.010	0.0050	1.0	0.100	5.60	5.90	0.30	5.00	4.50
					0.010	0.0050	1.0	0.100	5.90	6.15	0.25	4.00	
95		6.66	137.60	272.00	0.010	0.0050	1.0	0.100	2.30	2.55	0.25	4.00	3.50
					0.010	0.0050	1.0	0.100	2.55	2.75	0.20	3.00	
99	15	7.77	185.70	329.30	0.010	0.0050	1.0	0.100	1.45	1.70	0.25	4.00	5.00
					0.010	0.0050	1.0	0.100	1.70	2.05	0.35	6.00	
102		8.01	145.90	180.20	0.010	0.0050	1.0	0.100	1.75	2.00	0.25	4.00	6.50
					0.010	0.0050	1.0	0.100	2.00	2.50	0.50	9.00	
106	16	6.85	172.40	466.50	0.010	0.0050	1.0	0.100	0.00	0.25	0.25	4.00	4.00
					0.010	0.0050	1.0	0.100	0.25	0.50	0.25	4.00	
109		7.74	130.40	312.70	0.010	0.0050	1.0	0.100	3.05	3.30	0.25	4.00	4.00
					0.010	0.0050	1.0	0.100	3.30	3.55	0.25	4.00	
113	17	8.24	236.00	325.90	0.010	0.0050	1.0	0.100	6.55	6.80	0.25	4.00	4.00
					0.010	0.0050	1.0	0.100	6.80	7.05	0.25	4.00	
116		8.27	172.10	199.00	0.010	0.0050	1.0	0.100	0.60	0.80	0.20	3.00	3.50
					0.010	0.0050	1.0	0.100	0.80	1.05	0.25	4.00	
120	18	7.97	258.00	328.80	0.010	0.0050	1.0	0.100	4.60	4.85	0.25	4.00	4.00
					0.010	0.0050	1.0	0.100	4.85	5.10	0.25	4.00	
123		8.12	201.00	213.60	0.010	0.0050	1.0	0.100	4.90	5.10	0.20	3.00	3.00
					0.010	0.0050	1.0	0.100	5.10	5.30	0.20	3.00	
127	19	7.80	300.00	359.70	0.010	0.0050	1.0	0.100	0.90	1.15	0.25	4.00	3.50
					0.010	0.0050	1.0	0.100	1.15	1.35	0.20	3.00	
130		6.54	275.00	358.60	0.010	0.0050	1.0	0.100	3.70	3.95	0.25	4.00	4.00
					0.010	0.0050	1.0	0.100	3.95	4.20	0.25	4.00	
134	20	7.57	434.00	207.90	0.010	0.0050	1.0	0.100	2.40	2.65	0.25	4.00	3.50
					0.010	0.0050	1.0	0.100	2.65	2.85	0.20	3.00	
137		7.65	417.00	381.00	0.010	0.0050	1.0	0.100	4.70	4.90	0.20	3.00	3.50
					0.010	0.0050	1.0	0.100	4.90	5.15	0.25	4.00	
141	21	7.74	506.00	357.70	0.010	0.0050	1.0	0.100	6.70	7.00	0.30	5.00	4.00
					0.010	0.0050	1.0	0.100	7.00	7.20	0.20	3.00	
144		7.92	475.00	342.00	0.010	0.0050	1.0	0.100	3.20	3.45	0.25	4.00	4.00
					0.010	0.0050	1.0	0.100	3.45	3.70	0.25	4.00	

TKW-28

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	7.40	660.00	140.60	0.001	0.0005	3.50	0.001	0.00	7.80	7.80	1.21	1.19
					0.001	0.0005	3.50	0.001	0.00	7.60	7.60	1.17	
4		7.58	314.00	141.50	0.001	0.0005	10.00	0.001	4.00	5.90	1.90	-0.62	-0.62
					0.001	0.0005	10.00	0.001	6.00	7.90	1.90	-0.62	
8	2	7.81	253.00	190.00	0.010	0.0050	2.00	0.010	0.00	3.20	3.20	4.40	4.30
					0.010	0.0050	2.00	0.010	3.20	6.30	3.10	4.20	
11		8.44	212.00	146.10	0.010	0.0050	1.00	0.010	4.40	5.80	1.40	1.80	1.90
					0.010	0.0050	1.00	0.010	5.80	7.30	1.50	2.00	
15	3	8.25	236.00	157.40	0.010	0.0050	1.00	0.010	0.00	1.70	1.70	2.40	2.40
					0.010	0.0050	1.00	0.010	1.70	3.40	1.70	2.40	
18		8.42	187.30	73.70	0.010	0.0050	1.00	0.010	0.00	1.70	1.70	2.40	2.40
					0.010	0.0050	1.00	0.010	1.70	3.40	1.70	2.40	
22	4	8.47	202.00	236.50	0.010	0.0050	1.00	0.010	0.00	1.90	1.90	2.80	2.80
					0.010	0.0050	1.00	0.010	1.90	3.80	1.90	2.80	
25		8.48	196.10	135.50	0.010	0.0050	1.00	0.010	16.40	18.10	1.70	2.40	2.60
					0.010	0.0050	1.00	0.010	18.10	20.00	1.90	2.80	
29	5	8.00	175.70	157.30	0.010	0.0050	1.00	0.010	6.90	8.80	1.90	2.80	2.70
					0.010	0.0050	1.00	0.010	8.80	10.60	1.80	2.60	
32		8.05	189.70	54.50	0.010	0.0050	1.00	0.010	18.70	20.40	1.70	2.40	2.30
					0.010	0.0050	1.00	0.010	20.40	22.00	1.60	2.20	
36	6	8.41	237.00	161.80	0.010	0.0050	1.00	0.010	8.90	10.50	1.60	2.20	2.10
					0.010	0.0050	1.00	0.010	10.50	12.00	1.50	2.00	
39		8.23	193.90	169/7	0.010	0.0050	1.00	0.010	18.90	20.50	1.60	2.20	2.20
					0.010	0.0050	1.00	0.010	20.50	22.10	1.60	2.20	
43	7	8.32	218.00	251.90	0.010	0.0050	1.00	0.010	12.90	14.40	1.50	2.00	2.10
					0.010	0.0050	1.00	0.010	14.40	16.00	1.60	2.20	
46		8.37	168.60	157.60	0.010	0.0050	1.00	0.010	0.00	1.50	1.50	2.00	2.10
					0.010	0.0050	1.00	0.010	1.50	3.10	1.60	2.20	
50	8	8.23	206.00	171.80	0.010	0.0050	1.00	0.010	0.00	1.60	1.60	2.20	2.20
					0.010	0.0050	1.00	0.010	1.60	3.20	1.60	2.20	
53		8.57	180.70	308.20	0.010	0.0050	1.00	0.010	11.70	13.60	1.90	2.80	2.80
					0.010	0.0050	1.00	0.010	13.60	15.50	1.90	2.80	
57	9	6.62	193.40	192.40	0.010	0.0050	1.00	0.010	19.80	21.90	2.10	3.20	3.10
					0.010	0.0050	1.00	0.010	21.90	23.90	2.00	3.00	
60		7.94	184.30	166.30	0.010	0.0050	1.00	0.010	3.30	5.10	1.80	2.60	2.80
					0.010	0.0050	1.00	0.010	5.10	7.10	2.00	3.00	
64	10	7.88	174.20	214.20	0.010	0.0050	1.00	0.010	13.90	15.90	2.00	3.00	3.10
					0.010	0.0050	1.00	0.010	15.90	18.00	2.10	3.20	
67		8.42	149.30	253.30	0.010	0.0050	1.00	0.010	15.80	18.00	2.20	3.40	3.50
					0.010	0.0050	1.00	0.010	18.00	20.30	2.30	3.60	
71	11	8.50	280.00	299.60	0.010	0.0050	1.00	0.010	20.20	22.30	2.10	3.20	3.20
					0.010	0.0050	1.00	0.010	0.00	2.10	2.10	3.20	
74		8.36	130.20	233.70	0.010	0.0050	1.00	0.010	8.00	10.00	2.00	3.00	3.00
					0.010	0.0050	1.00	0.010	10.00	12.00	2.00	3.00	

TKW-28

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	7.92	44.70	140.70	0.010	0.0050	1.00	0.010	9.40	11.60	2.20	3.40	3.30
					0.010	0.0050	1.00	0.010	11.60	13.70	2.10	3.20	
81		8.35	127.20	129.00	0.010	0.0050	1.00	0.100	3.45	3.65	0.20	3.00	3.00
					0.010	0.0050	1.00	0.100	3.65	3.85	0.20	3.00	
85	13	7.24	128.50	206.80	0.010	0.0050	1.00	0.100	2.75	2.95	0.20	3.00	3.50
					0.010	0.0050	1.00	0.100	2.95	3.20	0.25	4.00	
88		8.52	141.90	286.70	0.010	0.0050	1.00	0.100	0.85	1.05	0.20	3.00	3.50
					0.010	0.0050	1.00	0.100	1.05	1.30	0.25	4.00	
92	14	8.05	122.20	275.80	0.010	0.0050	1.00	0.100	0.85	1.10	0.25	4.00	3.00
					0.010	0.0050	1.00	0.100	1.10	1.25	0.15	2.00	
95		7.68	276.00	312.50	0.010	0.0050	1.00	0.100	0.40	0.55	0.15	2.00	3.00
					0.010	0.0050	1.00	0.100	0.55	0.80	0.25	4.00	
99	15	7.88	158.90	313.30	0.010	0.0050	1.00	0.100	2.85	3.05	0.20	3.00	3.50
					0.010	0.0050	1.00	0.100	3.05	3.30	0.25	4.00	
102		8.30	147.30	70.20	0.010	0.0050	1.00	0.100	4.60	4.80	0.20	3.00	3.00
					0.010	0.0050	1.00	0.100	4.80	5.00	0.20	3.00	
106	16	8.16	116.10	282.70	0.010	0.0050	1.00	0.100	1.30	1.50	0.20	3.00	3.50
					0.010	0.0050	1.00	0.100	1.50	1.75	0.25	4.00	
109		8.24	148.80	307.50	0.010	0.0050	1.00	0.100	1.70	1.85	0.15	2.00	2.50
					0.010	0.0050	1.00	0.100	1.85	2.05	0.20	3.00	
113	17	8.15	174.00	315.90	0.010	0.0050	1.00	0.100	7.45	7.70	0.25	4.00	3.50
					0.010	0.0050	1.00	0.100	7.70	7.90	0.20	3.00	
116		8.28	138.10	188.00	0.010	0.0050	1.00	0.100	1.95	2.15	0.20	3.00	3.00
					0.010	0.0050	1.00	0.100	2.15	2.35	0.20	3.00	
120	18	8.09	171.60	350.40	0.010	0.0050	1.00	0.100	0.45	0.65	0.20	3.00	3.08
					0.010	0.0050	1.00	0.100	0.65	0.86	0.21	3.16	
123		8.41	132.80	197.50	0.010	0.0050	1.00	0.100	4.45	4.65	0.20	3.00	3.00
					0.010	0.0050	1.00	0.100	4.65	4.85	0.20	3.00	
127	19	8.02	149.10	320.40	0.010	0.0050	1.00	0.100	1.75	1.95	0.20	3.00	3.00
					0.010	0.0050	1.00	0.100	1.95	2.15	0.20	3.00	
130		5.32	166.50	365.50	0.010	0.0050	1.00	0.100	3.25	3.45	0.20	3.00	3.50
					0.010	0.0050	1.00	0.100	3.45	3.70	0.25	4.00	
134	20	8.17	148.20	197.10	0.010	0.0050	1.00	0.100	4.05	4.20	0.15	2.00	2.50
					0.010	0.0050	1.00	0.100	4.20	4.40	0.20	3.00	
137		8.35	147.90	349.10	0.010	0.0050	1.00	0.100	5.95	6.10	0.15	2.00	2.50
					0.010	0.0050	1.00	0.100	6.10	6.30	0.20	3.00	
141	21	8.44	151.90	343.70	0.010	0.0050	1.00	0.100	5.45	5.65	0.20	3.00	3.00
					0.010	0.0050	1.00	0.100	5.65	5.85	0.20	3.00	
144		8.48	133.30	316.80	0.010	0.0050	1.00	0.100	6.40	6.60	0.20	3.00	3.00
					0.010	0.0050	1.00	0.100	6.60	6.80	0.20	3.00	

TKW-29

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	7.39	1452.00	146.70	0.001	0.0005	5	0.001	0.00	10.50	10.50	1.60	1.61
					0.001	0.0005	5	0.001	10.50	21.10	10.60	1.62	
4		7.83	550.00	176.30	0.001	0.0005	10	0.001	0.00	1.90	1.90	-0.62	-0.61
					0.001	0.0005	10	0.001	2.00	4.00	2.00	-0.60	
8	2	8.26	399.00	163.70	0.010	0.0050	2	0.010	6.50	9.50	3.00	4.00	3.50
					0.010	0.0050	2	0.010	9.50	12.00	2.50	3.00	
11		8.02	306.00	161.51	0.010	0.0050	1	0.010	7.30	8.90	1.60	2.20	2.30
					0.010	0.0050	1	0.010	8.90	10.60	1.70	2.40	
15	3	7.66	310.00	184.80	0.010	0.0050	1	0.010	5.70	7.60	1.90	2.80	2.50
					0.010	0.0050	1	0.010	7.60	9.20	1.60	2.20	
18		8.6	165.60	233.80	0.010	0.0050	1	0.010	13.70	15.50	1.80	2.60	2.90
					0.010	0.0050	1	0.010	15.50	17.60	2.10	3.20	
22	4	8.3	325.00	281.10	0.010	0.0050	1	0.010	2.90	4.70	1.80	2.60	2.60
					0.010	0.0050	1	0.010	4.70	6.50	1.80	2.60	
25		8.38	241.00	179.25	0.010	0.0050	1	0.010	18.10	20.00	1.90	2.80	2.70
					0.010	0.0050	1	0.010	3.20	5.00	1.80	2.60	
29	5	8.19	242.00	77.40	0.010	0.0050	1	0.010	17.60	19.50	1.90	2.80	2.70
					0.010	0.0050	1	0.010	19.50	21.30	1.80	2.60	
32		8.14	230.00	72.00	0.010	0.0050	1	0.010	4.10	5.40	1.30	1.60	1.40
					0.010	0.0050	1	0.010	5.40	6.50	1.10	1.20	
36	6	8.21	243.00	153.00	0.010	0.0050	1	0.010	15.40	17.00	1.60	2.20	2.20
					0.010	0.0050	1	0.010	17.00	18.60	1.60	2.20	
39		8.03	221.00	169.50	0.010	0.0050	1	0.010	11.80	13.40	1.60	2.20	2.10
					0.010	0.0050	1	0.010	13.40	14.90	1.50	2.00	
43	7	8.29	256.00	213.40	0.010	0.0050	1	0.010	20.10	21.60	1.50	2.00	2.20
					0.010	0.0050	1	0.010	21.60	23.30	1.70	2.40	
46		8.25	195.90	146.90	0.010	0.0050	1	0.010	8.90	10.40	1.50	2.00	2.10
					0.010	0.0050	1	0.010	10.40	12.00	1.60	2.20	
50	8	8.46	263.00	211.30	0.010	0.0050	1	0.010	3.20	4.70	1.50	2.00	3.89
					0.010	0.0050	1	0.010	4.70	8.09	3.39	5.78	
53		8.09	206.00	232.10	0.010	0.0050	1	0.010	11.20	13.10	1.90	2.80	2.90
					0.010	0.0050	1	0.010	13.10	15.10	2.00	3.00	
57	9	7.97	262.00	176.70	0.010	0.0050	1	0.010	9.10	10.80	1.70	2.40	2.50
					0.010	0.0050	1	0.010	10.80	12.60	1.80	2.60	
60		7.95	223.00	168.40	0.010	0.0050	1	0.010	12.90	14.90	2.00	3.00	2.90
					0.010	0.0050	1	0.010	14.90	16.80	1.90	2.80	
64	10	8.26	243.00	214.70	0.010	0.0050	1	0.010	14.80	16.60	1.80	2.60	2.60
					0.010	0.0050	1	0.010	16.60	18.40	1.80	2.60	
67		8.41	350.00	240.60	0.010	0.0050	1	0.010	17.30	19.20	1.90	2.80	2.80
					0.010	0.0050	1	0.010	19.20	21.10	1.90	2.80	
71	11	8.22	439.00	288.40	0.010	0.0050	1	0.010	7.70	9.70	2.00	3.00	2.90
					0.010	0.0050	1	0.010	9.70	11.60	1.90	2.80	
74		8.17	224.00	251.80	0.010	0.0050	1	0.010	1.80	3.80	2.00	3.00	2.90
					0.010	0.0050	1	0.010	3.80	5.70	1.90	2.80	

TKW-29

Days	Cycle no.	pH	EC (µS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	8.15	116.70	168.70	0.010	0.0050	1	0.010	0.00	2.00	2.00	3.00	3.00
					0.010	0.0050	1	0.010	2.00	4.00	2.00	3.00	
81		7.73	225.00	135.90	0.010	0.0050	1	0.100	1.50	1.65	0.15	2.00	2.50
					0.010	0.0050	1	0.100	1.65	1.85	0.20	3.00	
85	13	7.2	223.00	281.20	0.010	0.0050	1	0.100	3.20	3.40	0.20	3.00	3.50
					0.010	0.0050	1	0.100	3.40	3.65	0.25	4.00	
88		8.44	209.00	299.20	0.010	0.0050	1	0.100	3.95	4.30	0.35	6.00	6.00
					0.010	0.0050	1	0.100	4.30	4.65	0.35	6.00	
92	14	8.53	311.00	207.10	0.010	0.0050	1	0.100	0.00	0.20	0.20	3.00	3.50
					0.010	0.0050	1	0.100	0.20	0.45	0.25	4.00	
95		7.85	275.00	280.00	0.010	0.0050	1	0.100	0.80	0.95	0.15	2.00	2.50
					0.010	0.0050	1	0.100	0.95	1.15	0.20	3.00	
99	15	7.93	315.00	343.60	0.010	0.0050	1	0.100	3.65	3.85	0.20	3.00	3.00
					0.010	0.0050	1	0.100	3.85	4.05	0.20	3.00	
102		8.15	322.00	180.20	0.010	0.0050	1	0.100	3.80	4.00	0.20	3.00	3.50
					0.010	0.0050	1	0.100	4.00	4.25	0.25	4.00	
106	16	7.98	350.00	280.20	0.010	0.0050	1	0.100	5.05	5.20	0.15	2.00	2.50
					0.010	0.0050	1	0.100	5.20	5.40	0.20	3.00	
109		7.68	311.00	309.10	0.010	0.0050	1	0.100	2.60	2.75	0.15	2.00	3.50
					0.010	0.0050	1	0.100	2.75	3.05	0.30	5.00	
113	17	8.06	468.00	330.20	0.010	0.0050	1	0.100	5.30	5.55	0.25	4.00	3.50
					0.010	0.0050	1	0.100	5.55	5.75	0.20	3.00	
116		8.19	316.00	198.20	0.010	0.0050	1	0.100	3.60	3.85	0.25	4.00	3.00
					0.010	0.0050	1	0.100	3.85	4.00	0.15	2.00	
120	18	7.94	435.00	348.00	0.010	0.0050	1	0.100	1.25	1.50	0.25	4.00	3.00
					0.010	0.0050	1	0.100	1.50	1.65	0.15	2.00	
123		8.26	312.00	217.70	0.010	0.0050	1	0.100	7.25	7.50	0.25	4.00	3.50
					0.010	0.0050	1	0.100	7.50	7.70	0.20	3.00	
127	19	7.95	396.00	316.60	0.010	0.0050	1	0.100	3.35	3.55	0.20	3.00	3.00
					0.010	0.0050	1	0.100	3.55	3.75	0.20	3.00	
130		8.26	332.00	357.40	0.010	0.0050	1	0.100	2.80	3.00	0.20	3.00	3.50
					0.010	0.0050	1	0.100	3.00	3.25	0.25	4.00	
134	20	8	376.00	207.50	0.010	0.0050	1	0.100	4.40	4.60	0.20	3.00	3.00
					0.010	0.0050	1	0.100	4.60	4.80	0.20	3.00	
137		8.21	345.00	342.90	0.010	0.0050	1	0.100	8.30	8.50	0.20	3.00	3.00
					0.010	0.0050	1	0.100	8.50	8.70	0.20	3.00	
141	21	8.45	108.70	315.10	0.010	0.0050	1	0.100	7.20	7.40	0.20	3.00	3.00
					0.010	0.0050	1	0.100	7.40	7.60	0.20	3.00	
144		8.35	344.00	329.70	0.010	0.0050	1	0.100	2.80	3.00	0.20	3.00	3.00
					0.010	0.0050	1	0.100	3.00	3.20	0.20	3.00	

TKW-30

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	7.47	1281.00	147.70	0.001	0.0005	6.0	0.001	0.00	0.90	0.90	-0.42	-0.42
					0.001	0.0005	6.0	0.001	1.00	1.90	0.90	-0.42	
4		7.77	47.60	227.70	0.010	0.0050	0.3	0.010	5.60	10.10	4.50	8.70	8.10
					0.010	0.0050	0.3	0.010	11.00	14.90	3.90	7.50	
8	2	7.83	6.44	74.40	0.010	0.0050	1.5	0.010	14.90	20.50	5.60	9.70	4.10
					0.010	0.0050	1.5	0.010	14.90	14.90	0.00	-1.50	
11		7.66	423.00	177.20	0.010	0.0050	1.0	0.010	3.20	4.80	1.60	2.20	2.20
					0.010	0.0050	1.0	0.010	4.80	6.40	1.60	2.20	
15	3	8.13	308.00	72.60	0.010	0.0050	1.0	0.010	11.70	13.10	1.40	1.80	1.80
					0.010	0.0050	1.0	0.010	13.10	14.50	1.40	1.80	
18		7.72	302.00	78.90	0.010	0.0050	1.0	0.010	8.90	10.60	1.70	2.40	2.60
					0.010	0.0050	1.0	0.010	10.60	12.50	1.90	2.80	
22	4	8.33	269.00	80.80	0.010	0.0050	1.0	0.010	8.10	9.90	1.80	2.60	2.10
					0.010	0.0050	1.0	0.010	9.90	11.20	1.30	1.60	
25		7.96	257.00	59.50	0.010	0.0050	1.0	0.010	10.30	12.10	1.80	2.60	2.40
					0.010	0.0050	1.0	0.010	12.10	13.70	1.60	2.20	
29	5	7.79	232.00	214.00	0.010	0.0050	1.0	0.010	7.60	9.20	1.60	2.20	2.20
					0.010	0.0050	1.0	0.010	9.20	10.80	1.60	2.20	
32		8.20	223.00	101.90	0.010	0.0050	1.0	0.010	0.00	1.40	1.40	1.80	2.00
					0.010	0.0050	1.0	0.010	1.40	3.00	1.60	2.20	
36	6	8.25	215.00	342.20	0.010	0.0050	1.0	0.010	0.00	1.80	1.80	2.60	2.20
					0.010	0.0050	1.0	0.010	1.80	3.20	1.40	1.80	
39		8.30	213.00	163.10	0.010	0.0050	1.0	0.010	9.90	11.50	1.60	2.20	2.40
					0.010	0.0050	1.0	0.010	11.50	13.30	1.80	2.60	
43	7	8.23	202.00	242.10	0.010	0.0050	1.0	0.010	16.80	18.40	1.60	2.20	2.50
					0.010	0.0050	1.0	0.010	18.40	20.30	1.90	2.80	
46		8.27	199.10	190.50	0.010	0.0050	1.0	0.010	18.80	20.50	1.70	2.40	2.30
					0.010	0.0050	1.0	0.010	20.50	22.10	1.60	2.20	
50	8	7.87	190.30	233.00	0.010	0.0050	1.0	0.010	8.60	10.60	2.00	3.00	2.90
					0.010	0.0050	1.0	0.010	10.60	12.50	1.90	2.80	
53		8.62	207.00	225.90	0.010	0.0050	1.0	0.100	0.40	0.60	0.20	3.00	4.00
					0.010	0.0050	1.0	0.100	0.60	0.90	0.30	5.00	
57	9	7.31	176.40	290.50	0.010	0.0050	1.0	0.100	5.20	5.40	0.20	3.00	3.50
					0.010	0.0050	1.0	0.100	5.40	5.65	0.25	4.00	
60		7.89	141.60	154.60	0.010	0.0050	1.0	0.100	3.20	3.35	0.15	2.00	3.00
					0.010	0.0050	1.0	0.100	3.35	3.60	0.25	4.00	
64	10	8.15	165.20	213.00	0.010	0.0050	1.0	0.100	2.75	2.85	0.10	1.00	3.00
					0.010	0.0050	1.0	0.100	2.85	3.15	0.30	5.00	
67		7.47	227.00	121.70	0.010	0.0050	1.0	0.100	1.95	2.15	0.20	3.00	3.50
					0.010	0.0050	1.0	0.100	2.15	2.40	0.25	4.00	
71	11	8.24	169.80	215.20	0.010	0.0050	1.0	0.100	3.45	3.70	0.25	4.00	3.50
					0.010	0.0050	1.0	0.100	3.70	3.90	0.20	3.00	
74		8.08	198.00	120.00	0.010	0.0050	1.0	0.100	4.30	4.55	0.25	4.00	3.50
					0.010	0.0050	1.0	0.100	4.55	4.75	0.20	3.00	

TKW-30

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	8.18	155.20	126.30	0.010	0.0050	1.0	0.100	1.70	1.90	0.20	3.00	3.50
					0.010	0.0050	1.0	0.100	1.90	2.15	0.25	4.00	
81		7.92	160.60	318.70	0.010	0.0050	1.0	0.100	2.95	3.25	0.30	5.00	4.00
					0.010	0.0050	1.0	0.100	3.25	3.45	0.20	3.00	
85	13	8.46	152.00	181.70	0.010	0.0050	1.0	0.100	0.40	0.60	0.20	3.00	3.50
					0.010	0.0050	1.0	0.100	0.60	0.85	0.25	4.00	
88		7.96	160.70	248.20	0.010	0.0050	1.0	0.100	3.40	3.65	0.25	4.00	3.50
					0.010	0.0050	1.0	0.100	3.65	3.85	0.20	3.00	
92	14	8.40	161.30	170.70	0.010	0.0050	1.0	0.100	1.80	2.00	0.20	3.00	3.00
					0.010	0.0050	1.0	0.100	2.00	2.20	0.20	3.00	
95		7.56	207.00	194.90	0.010	0.0050	1.0	0.100	0.00	0.20	0.20	3.00	3.50
					0.010	0.0050	1.0	0.100	0.20	0.45	0.25	4.00	
99	15	8.11	158.90	230.40	0.010	0.0050	1.0	0.100	3.05	3.30	0.25	4.00	3.50
					0.010	0.0050	1.0	0.100	3.30	3.50	0.20	3.00	
102		7.96	161.20	210.40	0.010	0.0050	1.0	0.100	3.05	3.25	0.20	3.00	3.50
					0.010	0.0050	1.0	0.100	3.25	3.50	0.25	4.00	
106	16	7.97	166.40	216.40	0.010	0.0050	1.0	0.100	3.45	3.65	0.20	3.00	3.00
					0.010	0.0050	1.0	0.100	3.65	3.85	0.20	3.00	
109		7.89	161.90	196.60	0.010	0.0050	1.0	0.100	2.25	2.50	0.25	4.00	3.50
					0.010	0.0050	1.0	0.100	2.50	2.70	0.20	3.00	
113	17	8.21	151.80	197.30	0.010	0.0050	1.0	0.100	2.25	2.40	0.15	2.00	3.00
					0.010	0.0050	1.0	0.100	2.40	2.65	0.25	4.00	
116		7.83	154.60	231.10	0.010	0.0050	1.0	0.100	4.00	4.20	0.20	3.00	3.00
					0.010	0.0050	1.0	0.100	4.20	4.40	0.20	3.00	
120	18	8.07	154.60	209.70	0.010	0.0050	1.0	0.100	3.60	3.85	0.25	4.00	3.50
					0.010	0.0050	1.0	0.100	3.85	4.05	0.20	3.00	
123		7.80	148.00	216.20	0.010	0.0050	1.0	0.100	1.60	1.80	0.20	3.00	3.00
					0.010	0.0050	1.0	0.100	1.80	2.00	0.20	3.00	
127	19	7.50	143.00	211.60	0.010	0.0050	1.0	0.100	3.25	3.45	0.20	3.00	3.00
					0.010	0.0050	1.0	0.100	3.45	3.65	0.20	3.00	
130		8.27	177.50	145.40	0.010	0.0050	1.0	0.100	1.75	2.00	0.25	4.00	3.50
					0.010	0.0050	1.0	0.100	2.00	2.20	0.20	3.00	
134	20	8.03	160.90	317.40	0.010	0.0050	1.0	0.100	1.95	2.10	0.15	2.00	3.00
					0.010	0.0050	1.0	0.100	2.10	2.35	0.25	4.00	
137		8.17	157.40	256.60	0.010	0.0050	1.0	0.100	4.30	4.55	0.25	4.00	3.50
					0.010	0.0050	1.0	0.100	4.55	4.75	0.20	3.00	
141	21	7.93	159.80	229.80	0.010	0.0050	1.0	0.100	1.05	1.25	0.20	3.00	2.50
					0.010	0.0050	1.0	0.100	1.25	1.40	0.15	2.00	
144		8.53	179.80	495.30	0.010	0.0050	1.0	0.100	3.85	4.05	0.20	3.00	3.00
					0.010	0.0050	1.0	0.100	4.05	4.25	0.20	3.00	

TKW-59

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	7.59	1593.00	73.50	0.001	0.0005	6.0	0.010	0.00	1.40	1.40	2.20	0.95
					0.001	0.0005	6.0	0.001	0.00	1.50	1.50	-0.30	
4		8.14	541.00	177.80	0.010	0.0050	0.3	0.001	0.00	5.80	5.80	0.86	1.76
					0.010	0.0050	0.3	0.001	5.80	20.60	14.80	2.66	
8	2	7.16	415.00	60.70	0.010	0.0050	1.5	0.010	0.00	4.20	4.20	6.90	-1.30
					0.010	0.0050	1.5	0.010	8.20	4.20	-4.00	-9.50	
11		7.51	48.60	117.20	0.010	0.0050	1.0	0.010	0.00	3.20	3.20	5.40	5.50
					0.010	0.0050	1.0	0.010	3.20	6.50	3.30	5.60	
15	3	8.15	410.00	34.40	0.010	0.0050	1.0	0.010	11.60	15.20	3.60	6.20	6.20
					0.010	0.0050	1.0	0.010	15.20	18.80	3.60	6.20	
18		6.25	445.00	61.10	0.010	0.0050	1.0	0.010	11.60	15.90	4.30	7.60	7.70
					0.010	0.0050	1.0	0.010	15.90	20.30	4.40	7.80	
22	4	6.91	1686.00	49.80	0.010	0.0050	1.0	0.010	13.30	19.20	5.90	10.80	10.30
					0.010	0.0050	1.0	0.010	0.00	5.40	5.40	9.80	
25		6.26	812.00	15.70	0.010	0.0050	1.0	0.010	3.20	11.00	7.80	14.60	14.80
					0.010	0.0050	1.0	0.010	11.00	19.00	8.00	15.00	
29	5	6.19	1128.00	41.60	0.010	0.0050	1.0	0.010	0.00	13.40	13.40	25.80	26.10
					0.010	0.0050	1.0	0.010	0.00	13.70	13.70	26.40	
32		5.87	1600.00	81.20	0.010	0.0050	1.0	0.010	0.00	17.60	17.60	34.20	35.40
					0.010	0.0050	1.0	0.010	0.00	18.80	18.80	36.60	
36	6	5.08	1679.00	196.40	0.010	0.0050	1.0	0.010	3.20	24.40	21.20	41.40	41.50
					0.010	0.0050	1.0	0.010	0.00	21.30	21.30	41.60	
39		4.70	2640.00	256.70	0.010	0.0050	1.0	0.010	0.00	34.00	34.00	67.00	67.90
					0.010	0.0050	1.0	0.010	0.00	34.90	34.90	68.80	
43	7	4.59	1956.00	170.30	0.010	0.0050	1.0	0.010	0.00	26.50	26.50	52.00	52.10
					0.010	0.0050	1.0	0.010	0.00	26.60	26.60	52.20	
46		4.52	2130.00	201.50	0.010	0.0050	1.0	0.010	0.00	25.30	25.30	49.60	50.50
					0.010	0.0050	1.0	0.010	0.00	26.20	26.20	51.40	
50	8	4.38	1511.00	187.60	0.010	0.0050	1.0	0.010	0.00	12.30	12.30	23.60	23.50
					0.010	0.0050	1.0	0.010	12.30	24.50	12.20	23.40	
53		4.57	1181.00	220.60	0.010	0.0050	1.0	0.100	5.40	6.20	0.80	15.00	16.00
					0.010	0.0050	1.0	0.100	6.20	7.10	0.90	17.00	
57	9	4.81	1477.00	186.60	0.010	0.0050	1.0	0.100	6.05	7.10	1.05	20.00	19.50
					0.010	0.0050	1.0	0.100	7.10	8.10	1.00	19.00	
60		4.16	492.00	263.40	0.010	0.0050	1.0	0.100	5.35	5.95	0.60	11.00	11.50
					0.010	0.0050	1.0	0.100	5.95	6.60	0.65	12.00	
64	10	5.03	356.00	153.00	0.010	0.0050	1.0	0.100	4.35	4.70	0.35	6.00	6.50
					0.010	0.0050	1.0	0.100	4.70	5.10	0.40	7.00	
67		4.83	819.00	184.90	0.010	0.0050	1.0	0.100	3.55	4.20	0.65	12.00	11.50
					0.010	0.0050	1.0	0.100	4.20	4.80	0.60	11.00	
71	11	5.08	667.00	194.10	0.010	0.0050	1.0	0.100	6.55	7.10	0.55	10.00	9.50
					0.010	0.0050	1.0	0.100	7.10	7.60	0.50	9.00	
74		5.08	611.00	157.70	0.010	0.0050	1.0	0.100	2.40	2.90	0.50	9.00	9.00
					0.010	0.0050	1.0	0.100	2.90	3.40	0.50	9.00	

TKW-59

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	5.46	637.00	139.90	0.010	0.0050	1.0	0.100	2.40	2.75	0.35	6.00	9.00
					0.010	0.0050	1.0	0.100	2.75	3.40	0.65	12.00	
81		5.43	645.00	230.30	0.010	0.0050	1.0	0.100	6.35	7.00	0.65	12.00	11.00
					0.010	0.0050	1.0	0.100	7.00	7.55	0.55	10.00	
85	13	5.76	646.00	142.90	0.010	0.0050	1.0	0.100	5.45	5.95	0.50	9.00	9.00
					0.010	0.0050	1.0	0.100	5.95	6.45	0.50	9.00	
88		5.04	296.00	210.80	0.010	0.0050	1.0	0.100	3.65	4.00	0.35	6.00	6.50
					0.010	0.0050	1.0	0.100	4.00	4.40	0.40	7.00	
92	14	4.92	343.00	233.80	0.010	0.0050	1.0	0.100	5.95	6.25	0.30	5.00	5.50
					0.010	0.0050	1.0	0.100	6.25	6.60	0.35	6.00	
95		5.17	254.00	201.40	0.010	0.0050	1.0	0.100	5.40	5.75	0.35	6.00	5.50
					0.010	0.0050	1.0	0.100	5.75	6.05	0.30	5.00	
99	15	5.38	456.00	155.60	0.010	0.0050	1.0	0.100	4.85	5.30	0.45	8.00	7.50
					0.010	0.0050	1.0	0.100	5.30	5.70	0.40	7.00	
102		5.73	290.00	178.40	0.010	0.0050	1.0	0.100	5.65	6.05	0.40	7.00	6.50
					0.010	0.0050	1.0	0.100	6.05	6.40	0.35	6.00	
106	16	5.16	419.00	257.30	0.010	0.0050	1.0	0.100	5.95	6.35	0.40	7.00	7.00
					0.010	0.0050	1.0	0.100	6.35	6.75	0.40	7.00	
109		4.82	480.00	199.40	0.010	0.0050	1.0	0.100	8.45	9.00	0.55	10.00	9.00
					0.010	0.0050	1.0	0.100	9.00	9.45	0.45	8.00	
113	17	4.86	353.00	233.20	0.010	0.0050	1.0	0.100	6.95	7.40	0.45	8.00	7.50
					0.010	0.0050	1.0	0.100	7.40	7.80	0.40	7.00	
116		4.79	556.00	214.40	0.010	0.0050	1.0	0.100	6.95	7.50	0.55	10.00	9.50
					0.010	0.0050	1.0	0.100	7.50	8.00	0.50	9.00	
120	18	4.55	544.00	223.30	0.010	0.0050	1.0	0.100	8.15	8.60	0.45	8.00	8.50
					0.010	0.0050	1.0	0.100	8.60	9.10	0.50	9.00	
123		5.22	394.00	395.90	0.010	0.0050	1.0	0.100	5.30	5.75	0.45	8.00	7.50
					0.010	0.0050	1.0	0.100	5.75	6.15	0.40	7.00	
127	19	5.26	381.00	194.50	0.010	0.0050	1.0	0.100	6.45	6.85	0.40	7.00	7.00
					0.010	0.0050	1.0	0.100	6.85	7.25	0.40	7.00	
130		5.27	277.00	222.50	0.010	0.0050	1.0	0.100	7.50	7.80	0.30	5.00	6.00
					0.010	0.0050	1.0	0.100	7.80	8.20	0.40	7.00	
134	20	4.71	280.00	203.30	0.010	0.0050	1.0	0.100	6.80	7.15	0.35	6.00	6.50
					0.010	0.0050	1.0	0.100	7.15	7.55	0.40	7.00	
137		4.79	196.00	232.50	0.010	0.0050	1.0	0.100	7.05	7.80	0.75	14.00	14.50
					0.010	0.0050	1.0	0.100	7.80	8.60	0.80	15.00	
141	21	4.59	143.70	188.40	0.010	0.0050	1.0	0.100	7.25	7.55	0.30	5.00	5.50
					0.010	0.0050	1.0	0.100	7.55	7.90	0.35	6.00	
144		4.04	518.00	286.20	0.010	0.0050	1.0	0.100	8.30	8.75	0.45	8.00	8.50
					0.010	0.0050	1.0	0.100	8.75	9.25	0.50	9.00	

TKW-60

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	7.33	2520.00	62.10	0.001	0.0005	4.00	0.00	4.20	12.20	8.00	1.20	1.58
					0.001	0.0005	4.00	0.00	0.00	11.80	11.80	1.96	
4		6.71	1296.00	164.00	0.001	0.0005	6.00	0.01	0.00	10.50	10.50	20.40	20.20
					0.001	0.0005	6.00	0.01	10.50	20.80	10.30	20.00	
8	2	7.17	624.00	94.11	0.010	0.0050	3.00	0.01	0.00	4.50	4.50	6.00	7.20
					0.010	0.0050	3.00	0.01	4.00	9.70	5.70	8.40	
11		6.49	513.00	188.40	0.010	0.0050	1.50	0.01	16.60	20.10	3.50	5.50	5.50
					0.010	0.0050	1.50	0.01	0.00	0.00	0.00	0.00	
15	3	7.30	1641.00	82.80	0.010	0.0050	1.00	0.01	0.00	5.50	5.50	10.00	9.80
					0.010	0.0050	1.00	0.01	5.50	10.80	5.30	9.60	
18		8.23	653.00	182.50	0.010	0.0050	1.00	0.01	2.20	7.00	4.80	8.60	8.50
					0.010	0.0050	1.00	0.01	7.00	11.70	4.70	8.40	
22	4	7.46	773.00	71.90	0.010	0.0050	1.00	0.01	11.40	17.10	5.70	10.40	10.40
					0.010	0.0050	1.00	0.01	17.10	22.80	5.70	10.40	
25		8.00	6.22	187.60	0.010	0.0050	1.00	0.01	4.50	10.20	5.70	10.40	10.40
					0.010	0.0050	1.00	0.01	10.20	15.90	5.70	10.40	
29	5	6.43	602.00	100.10	0.010	0.0050	1.00	0.01	2.60	6.40	3.80	6.60	6.00
					0.010	0.0050	1.00	0.01	6.40	9.60	3.20	5.40	
32		7.36	602.00	100.10	0.010	0.0050	1.00	0.01	2.60	6.40	3.80	6.60	6.00
					0.010	0.0050	1.00	0.01	6.40	9.60	3.20	5.40	
36	6	7.08	549.00	188.20	0.010	0.0050	1.00	0.01	10.80	14.80	4.00	7.00	7.10
					0.010	0.0050	1.00	0.01	14.80	18.90	4.10	7.20	
39		5.14	598.00	163.00	0.010	0.0050	1.00	0.01	8.00	12.10	4.10	7.20	7.10
					0.010	0.0050	1.00	0.01	12.10	16.10	4.00	7.00	
43	7	5.01	586.00	218.90	0.010	0.0050	1.00	0.01	0.00	5.00	5.00	9.00	8.90
					0.010	0.0050	1.00	0.01	5.00	9.90	4.90	8.80	
46		4.52	986.00	204.30	0.010	0.0050	1.00	0.01	0.00	9.50	9.50	18.00	18.50
					0.010	0.0050	0.00	0.01	9.50	19.00	9.50	19.00	
50	8	3.89	8100.00	223.50	0.010	0.0050	0.00	0.10	0.00	13.90	13.90	278.00	282.00
					0.010	0.0050	0.00	0.10	0.00	14.30	14.30	286.00	
53		3.57	7130.00	200.40	0.010	0.0050	0.00	0.10	10.40	21.20	10.80	216.00	216.00
					0.010	0.0050	0.00	0.10	0.00	0.00	0.00	0.00	
57	9	3.57	5340.00	239.50	0.010	0.0050	0.00	0.10	9.40	17.40	8.00	160.00	154.00
					0.010	0.0050	0.00	0.10	10.30	17.70	7.40	148.00	
60		3.65	4130.00	243.80	0.010	0.0050	0.00	0.10	3.60	9.45	5.85	117.00	113.00
					0.010	0.0050	0.00	0.10	3.10	8.55	5.45	109.00	
64	10	3.60	2380.00	367.00	0.010	0.0050	0.00	0.10	0.00	1.25	1.25	25.00	55.00
					0.010	0.0050	0.00	0.10	4.65	8.90	4.25	85.00	
67		3.75	3090.00	242.40	0.010	0.0050	0.00	0.10	0.00	4.35	4.35	87.00	88.00
					0.010	0.0050	0.00	0.10	0.00	4.45	4.45	89.00	
71	11	3.69	260.00	253.60	0.010	0.0050	0.00	0.10	5.80	8.50	2.70	54.00	54.00
					0.010	0.0050	0.00	0.10	0.00	2.70	2.70	54.00	
74		3.81	2320.00	252.90	0.010	0.0050	0.00	0.10	0.60	3.10	2.50	50.00	49.00
					0.010	0.0050	0.00	0.10	3.10	5.50	2.40	48.00	

TKW-60

Days	Cycle no.	pH	EC (µS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	4.10	3580.00	193.70	0.010	0.0050	0.00	0.10	5.60	8.00	2.40	48.00	48.00
					0.010	0.0050	0.00	0.10	0.00	2.40	2.40	48.00	
81		4.54	2930.00	183.30	0.010	0.0050	0.00	0.10	6.75	8.80	2.05	41.00	40.50
					0.010	0.0050	0.00	0.10	0.00	2.00	2.00	40.00	
85	13	3.80	1721.00	256.20	0.010	0.0050	0.00	0.10	1.5	2.45	0.95	19.00	18.00
					0.010	0.0050	0.00	0.10	2.45	3.3	0.85	17.00	
88		4.11	1850.00	249.80	0.010	0.0050	0.00	0.10	5.50	7.20	1.70	34.00	17.00
					0.010	0.0050	0.00	0.10	0.00	0.00	0.00	0.00	
92	14	3.95	1623.00	243.40	0.010	0.0050	0.00	0.10	4.75	6.10	1.35	27.00	27.50
					0.010	0.0050	0.00	0.10	6.10	7.50	1.40	28.00	
95		3.99	1387.00	234.90	0.010	0.0050	0.00	0.10	6.60	7.90	1.30	26.00	24.50
					0.010	0.0050	0.00	0.10	7.90	9.05	1.15	23.00	
99	15	3.97	1459.00	217,3	0.010	0.0050	0.00	0.10	6.05	7.30	1.25	25.00	24.50
					0.010	0.0050	0.00	0.10	7.30	8.50	1.20	24.00	
102		4.06	1259.00	222.00	0.010	0.0050	0.00	0.10	5.70	6.90	1.20	24.00	24.50
					0.010	0.0050	0.00	0.10	6.90	8.15	1.25	25.00	
106	16	4.18	1275.00	275.10	0.010	0.0050	0.00	0.10	6.40	7.65	1.25	25.00	25.00
					0.010	0.0050	0.00	0.10	7.65	8.90	1.25	25.00	
109		3.98	1148.00	261.70	0.010	0.0050	0.00	0.10	6.75	7.60	0.85	17.00	17.00
					0.010	0.0050	0.00	0.10	7.60	8.45	0.85	17.00	
113	17	3.91	1264.00	285.80	0.010	0.0050	0.00	0.10	6.30	7.40	1.10	22.00	21.50
					0.010	0.0050	0.00	0.10	7.40	8.45	1.05	21.00	
116		3.89	1338.00	254.40	0.010	0.0050	0.00	0.10	8.55	9.45	0.90	18.00	19.00
					0.010	0.0050	0.00	0.10	7.90	8.90	1.00	20.00	
120	18	3.80	1032.00	278.80	0.010	0.0050	0.00	0.10	8.00	9.00	1.00	20.00	20.00
					0.010	0.0050	0.00	0.10	9.00	10.00	1.00	20.00	
123		3.97	1000.00	213.80	0.010	0.0050	0.00	0.10	5.10	5.95	0.85	17.00	8.50
					0.010	0.0050	0.00	0.10	0.00	0.00	0.00	0.00	
127	19	3.81	985.00	272.70	0.010	0.0050	0.00	0.10	8.05	9.05	1.00	20.00	19.50
					0.010	0.0050	0.00	0.10	7.75	8.70	0.95	19.00	
130		3.94	884.00	268.50	0.010	0.0050	0.00	0.10	7.95	8.85	0.90	18.00	18.00
					0.010	0.0050	0.00	0.10	-	-	-	-	
134	20	4.38	1005.00	248.10	0.010	0.0050	0.00	0.10	8.20	9.35	1.15	23.00	22.00
					0.010	0.0050	0.00	0.10	8.15	9.20	1.05	21.00	
137		3.89	928.00	268.80	0.010	0.0050	0.00	0.10	5.95	6.80	0.85	17.00	17.00
					0.010	0.0050	0.00	0.10	-	-	-	-	
141	21	3.75	939.00	265.10	0.010	0.0050	0.00	0.10	6.40	6.70	2.85	57.00	67.00
					0.010	0.0050	0.00	0.10	6.7	7.05	3.85	77.00	
144		3.77	957.00	306.50	0.010	0.0050	0.00	0.10	6.6	7.4	4.85	97.00	107.00
					0.010	0.0050	0.00	0.10	7.40	8.30	5.85	117.00	

TKW-61

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	4.77	9360.00	108.90	0.001	0.0005	2.5	0.001	0.00	100.00	100.00	19.75	19.47
					0.001	0.0005	2.5	0.001	0.00	97.20	97.20	19.19	
4		3.96	3800.00	203.90	0.001	0.0005	6.0	0.001	0.00	150.00	150.00	29.40	14.70
					0.001	0.0005	6.0	0.001	0.00	0.00	0.00	0.00	
8	2	3.86	5880.00	173.40	0.010	0.0050	0.0	0.010	0.00	81.10	81.10	162.20	158.30
					0.010	0.0050	0.0	0.010	0.00	77.20	77.20	154.40	
11		3.80	4540.00	164.70	0.010	0.0050	1.5	0.010	0.00	16.70	16.70	31.90	32.10
					0.010	0.0050	1.5	0.010	0.00	16.90	16.90	32.30	
15	3	3.81	3350.00	185.20	0.010	0.0050	1.0	0.010	0.00	25.40	25.40	49.80	49.80
					0.010	0.0050	1.0	0.010	0.00	25.40	25.40	49.80	
18		4.52	2720.00	176.70	0.010	0.0050	1.0	0.010	0.00	19.80	19.80	38.60	38.60
					0.010	0.0050	1.0	0.010	0.00	19.80	19.80	38.60	
22	4	4.65	3170.00	130.10	0.010	0.0050	1.0	0.010	6.60	21.60	15.00	29.00	29.40
					0.010	0.0050	1.0	0.010	0.00	15.40	15.40	29.80	
25		4.60	175.60	155.40	0.010	0.0050	1.0	0.010	4.50	10.20	5.70	10.40	10.40
					0.010	0.0050	1.0	0.010	10.20	15.90	5.70	10.40	
29	5	4.52	1692.00	122.80	0.010	0.0050	1.0	0.010	0.00	11.60	11.60	22.20	22.40
					0.010	0.0050	1.0	0.010	11.60	23.40	11.80	22.60	
32		4.99	2440.00	114.00	0.010	0.0050	1.0	0.010	0.00	8.90	8.90	16.80	16.80
					0.010	0.0050	1.0	0.010	8.90	17.80	8.90	16.80	
36	6	4.81	1085.00	187.20	0.010	0.0050	1.0	0.010	0.00	7.30	7.30	13.60	6.30
					0.010	0.0050	1.0	0.010	0.00	0.00	0.00	-1.00	
39		4.48	1184.00	215.90	0.010	0.0050	1.0	0.010	9.90	18.30	8.40	15.80	16.00
					0.010	0.0050	1.0	0.010	0.00	8.60	8.60	16.20	
43	7	5.00	966.00	206.00	0.010	0.0050	1.0	0.010	0.00	6.90	6.90	12.80	12.80
					0.010	0.0050	1.0	0.010	6.90	13.80	6.90	12.80	
46		4.45	1263.00	204.70	0.010	0.0050	1.0	0.010	0.00	8.60	8.60	16.20	16.50
					0.010	0.0050	1.0	0.010	8.60	17.50	8.90	16.80	
50	8	4.59	1119.00	224.90	0.010	0.0050	1.0	0.010	10.80	18.40	7.60	14.20	14.30
					0.010	0.0050	1.0	0.010	0.00	7.70	7.70	14.40	
53		4.29	1148.00	213.50	0.010	0.0050	1.0	0.010	0.00	8.30	8.30	15.60	15.50
					0.010	0.0050	1.0	0.010	8.30	16.50	8.20	15.40	
57	9	4.51	768.00	205.60	0.010	0.0050	1.0	0.100	7.10	7.70	0.60	11.00	11.00
					0.010	0.0050	1.0	0.100	7.70	8.30	0.60	11.00	
60		4.36	909.00	217.10	0.010	0.0050	1.0	0.100	8.10	8.80	0.70	13.00	13.00
					0.010	0.0050	1.0	0.100	8.80	9.50	0.70	13.00	
64	10	4.34	636.00	271.60	0.010	0.0050	1.0	0.100	6.60	7.30	0.70	13.00	12.50
					0.010	0.0050	1.0	0.100	7.30	7.95	0.65	12.00	
67		4.57	947.00	198.60	0.010	0.0050	1.0	0.100	7.05	7.75	0.70	13.00	9.00
					0.010	0.0050	1.0	0.100	7.75	8.05	0.30	5.00	
71	11	4.94	578.00	193.40	0.010	0.0050	1.0	0.100	4.80	5.40	0.60	11.00	10.50
					0.010	0.0050	1.0	0.100	5.40	5.95	0.55	10.00	
74		4.99	1724.00	129.00	0.010	0.0050	1.0	0.100	7.60	8.20	0.60	11.00	11.00
					0.010	0.0050	1.0	0.100	0.00	0.60	0.60	11.00	

TKW-61

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	4.53	786.00	213.80	0.010	0.0050	1.0	0.100	3.40	4.05	0.65	12.00	11.00
					0.010	0.0050	1.0	0.100	4.05	4.60	0.55	10.00	
81		5.00	852.00	189.40	0.010	0.0050	1.0	0.100	0.80	1.50	0.70	13.00	15.00
					0.010	0.0050	1.0	0.100	1.50	2.40	0.90	17.00	
85	13	4.43	645.00	230.30	0.010	0.0050	1.0	0.100	6.35	7.00	0.65	12.00	11.00
					0.010	0.0050	1.0	0.100	7.00	7.55	0.55	10.00	
88		4.84	668.00	233.80	0.010	0.0050	1.0	0.100	6.30	6.80	0.50	9.00	10.00
					0.010	0.0050	1.0	0.100	6.80	7.40	0.60	11.00	
92	14	4.69	627.00	254.40	0.010	0.0050	1.0	0.100	7.50	8.05	0.55	10.00	9.50
					0.010	0.0050	1.0	0.100	1.30	1.80	0.50	9.00	
95		4.34	1210.00	216.60	0.010	0.0050	1.0	0.100	5.50	6.40	0.90	17.00	16.50
					0.010	0.0050	1.0	0.100	6.40	7.25	0.85	16.00	
99	15	4.20	736.00	227.40	0.010	0.0050	1.0	0.100	5.85	6.45	0.60	11.00	10.50
					0.010	0.0050	1.0	0.100	6.45	7.00	0.55	10.00	
102		4.33	757.00	216.20	0.010	0.0050	1.0	0.100	2.75	3.35	0.60	11.00	10.50
					0.010	0.0050	1.0	0.100	3.35	3.90	0.55	10.00	
106	16	4.33	569.00	241.20	0.010	0.0050	1.0	0.100	3.50	3.95	0.45	8.00	8.00
					0.010	0.0050	1.0	0.100	3.95	4.40	0.45	8.00	
109		4.16	545.00	251.60	0.010	0.0050	1.0	0.100	8.45	8.95	0.50	9.00	4.00
					0.010	0.0050	1.0	0.100	0.00	0.00	0.00	-1.00	
113	17	4.31	739.00	234.20	0.010	0.0050	1.0	0.100	8.00	8.60	0.60	11.00	10.50
					0.010	0.0050	1.0	0.100	8.60	9.15	0.55	10.00	
116		4.56	904.00	344.00	0.010	0.0050	1.0	0.100	5.75	6.30	0.55	10.00	11.00
					0.010	0.0050	1.0	0.100	6.30	6.95	0.65	12.00	
120	18	4.83	469.00	366.30	0.010	0.0050	1.0	0.100	5.80	6.50	0.70	13.00	10.50
					0.010	0.0050	1.0	0.100	6.50	6.95	0.45	8.00	
123		4.34	516.00	262.00	0.010	0.0050	1.0	0.100	6.65	7.10	0.45	8.00	8.50
					0.010	0.0050	1.0	0.100	7.10	7.60	0.50	9.00	
127	19	4.44	696.00	256.30	0.010	0.0050	1.0	0.100	6.15	6.75	0.60	11.00	11.50
					0.010	0.0050	1.0	0.100	6.75	7.40	0.65	12.00	
130		4.95	532.00	356.30	0.010	0.0050	1.0	0.100	5.50	6.00	0.50	9.00	8.50
					0.010	0.0050	1.0	0.100	6.00	6.45	0.45	8.00	
134	20	5.06	628.00	231.60	0.010	0.0050	1.0	0.100	6.45	6.90	0.45	8.00	9.50
					0.010	0.0050	1.0	0.100	6.90	7.50	0.60	11.00	
137		4.28	478.00	236.40	0.010	0.0050	1.0	0.100	7.55	8.05	0.50	9.00	8.50
					0.010	0.0050	1.0	0.100	8.05	8.50	0.45	8.00	
141	21	4.41	4.92	216.90	0.010	0.0050	1.0	0.100	5.50	6.00	0.50	9.00	9.00
					0.010	0.0050	1.0	0.100	-	-	-	-	
144		4.04	518.00	286.20	0.010	0.0050	1.0	0.100	5.84	6.40	0.56	10.20	6.60
					0.010	0.0050	1.0	0.100	6.40	6.60	0.20	3.00	

TKW-62

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	6.98	2580.00	52.20	0.001	0.0005	6.5	0.001	1.00	7.80	6.80	0.71	0.69
					0.001	0.0005	6.5	0.001	13.80	20.40	6.60	0.67	
4		5.34	1710.00	86.40	0.001	0.0005	6.0	0.010	0.00	3.70	3.70	6.80	7.20
					0.001	0.0005	6.0	0.010	3.70	7.80	4.10	7.60	
8	2	4.03	1576.00	400.10	0.010	0.0050	3.0	0.010	0.00	32.70	32.70	62.40	51.30
					0.010	0.0050	3.0	0.010	0.00	21.60	21.60	40.20	
11		4.68	415.00	133.30	0.010	0.0050	1.5	0.010	7.70	12.10	4.40	7.30	7.40
					0.010	0.0050	1.5	0.010	12.10	16.60	4.50	7.50	
15	3	3.62	2420.00	210.90	0.010	0.0050	1.0	0.010	0.00	32.90	32.90	64.80	64.50
					0.010	0.0050	1.0	0.010	0.00	32.60	32.60	64.20	
18		3.99	3580.00	194.50	0.010	0.0050	1.0	0.010	0.00	30.60	30.60	60.20	60.30
					0.010	0.0050	1.0	0.010	0.00	30.70	30.70	60.40	
22	4	4.15	3150.00	178.30	0.010	0.0050	1.0	0.010	0.00	28.50	28.50	56.00	57.10
					0.010	0.0050	1.0	0.010	0.00	29.60	29.60	58.20	
25		4.17	2690.00	204.50	0.010	0.0050	1.0	0.010	0.00	23.10	23.10	45.20	22.10
					0.010	0.0050	1.0	0.010	0.00	0.00	0.00	-1.00	
29	5	4.49	3080.00	340.80	0.010	0.0050	1.0	0.010	0.00	17.40	17.40	33.80	32.90
					0.010	0.0050	1.0	0.010	1.50	18.00	16.50	32.00	
32		4.83	1959.00	188.40	0.010	0.0050	1.0	0.010	0.00	11.90	11.90	22.80	22.30
					0.010	0.0050	1.0	0.010	11.90	23.30	11.40	21.80	
36	6	4.63	2210.00	150.60	0.010	0.0050	1.0	0.010	6.00	14.90	8.90	16.80	16.90
					0.010	0.0050	1.0	0.010	3.50	12.50	9.00	17.00	
39		4.66	1467.00	199.30	0.010	0.0050	1.0	0.010	8.60	18.30	9.70	18.40	18.50
					0.010	0.0050	1.0	0.010	12.70	22.50	9.80	18.60	
43	7	4.81	1181.00	175.80	0.010	0.0050	1.0	0.010	0.00	7.80	7.80	14.60	14.50
					0.010	0.0050	1.0	0.010	7.80	15.50	7.70	14.40	
46		4.60	1064.00	208.00	0.010	0.0050	1.0	0.010	13.10	19.90	6.80	12.60	12.40
					0.010	0.0050	1.0	0.010	0.00	6.60	6.60	12.20	
50	8	5.04	1061.00	429.70	0.010	0.0050	1.0	0.010	0.00	4.70	4.70	8.40	8.30
					0.010	0.0050	1.0	0.010	4.70	9.30	4.60	8.20	
53		4.37	718.00	199.70	0.010	0.0050	1.0	0.010	9.40	14.80	5.40	9.80	9.50
					0.010	0.0050	1.0	0.010	14.80	19.90	5.10	9.20	
57	9	4.71	654.00	195.40	0.010	0.0050	1.0	0.100	8.30	8.70	0.40	7.00	10.00
					0.010	0.0050	1.0	0.100	8.70	9.40	0.70	13.00	
60		4.65	665.00	196.50	0.010	0.0050	1.0	0.100	2.50	3.00	0.50	9.00	10.00
					0.010	0.0050	1.0	0.100	3.00	3.60	0.60	11.00	
64	10	4.50	421.00	224.30	0.010	0.0050	1.0	0.100	4.45	4.70	0.25	4.00	8.00
					0.010	0.0050	1.0	0.100	4.70	5.35	0.65	12.00	
67		4.83	515.00	194.40	0.010	0.0050	1.0	0.100	6.15	6.65	0.50	9.00	8.00
					0.010	0.0050	1.0	0.100	6.65	7.05	0.40	7.00	
71	11	5.07	543.00	196.80	0.010	0.0050	1.0	0.100	2.70	3.10	0.40	7.00	7.50
					0.010	0.0050	1.0	0.100	3.10	3.55	0.45	8.00	
74		4.19	596.00	258.40	0.010	0.0050	1.0	0.100	5.05	6.05	1.00	19.00	14.00
					0.010	0.0050	1.0	0.100	6.05	6.55	0.50	9.00	

TKW-62

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	5.10	453.00	199.70	0.010	0.0050	1.0	0.100	4.60	5.10	0.50	9.00	8.00
					0.010	0.0050	1.0	0.100	5.10	5.50	0.40	7.00	
81		5.19	477.00	176.30	0.010	0.0050	1.0	0.100	5.85	6.30	0.45	8.00	8.00
					0.010	0.0050	1.0	0.100	6.30	6.75	0.45	8.00	
85	13	5.21	990.00	162.20	0.010	0.0050	1.0	0.100	7.50	8.00	0.50	9.00	8.00
					0.010	0.0050	1.0	0.100	8.00	8.40	0.40	7.00	
88		5.08	407.00	207.10	0.010	0.0050	1.0	0.100	7.40	7.75	0.35	6.00	6.50
					0.010	0.0050	1.0	0.100	7.75	8.15	0.40	7.00	
92	14	4.11	1850.00	249.80	0.010	0.0050	1.0	0.100	5.50	7.20	1.70	33.00	33.00
					0.010	0.0050	1.0	0.100	0.00	0.00	0.00	0.00	
95		5.49	345.00	183.80	0.010	0.0050	1.0	0.100	2.90	3.25	0.35	6.00	6.50
					0.010	0.0050	1.0	0.100	3.25	3.65	0.40	7.00	
99	15	4.80	466.00	205.90	0.010	0.0050	1.0	0.100	7.25	7.70	0.45	8.00	8.00
					0.010	0.0050	1.0	0.100	7.70	8.15	0.45	8.00	
102		4.71	347.00	203.30	0.010	0.0050	1.0	0.100	5.15	5.50	0.35	6.00	6.00
					0.010	0.0050	1.0	0.100	5.50	5.85	0.35	6.00	
106	16	4.59	357.00	207.70	0.010	0.0050	1.0	0.100	3.90	4.30	0.40	7.00	7.50
					0.010	0.0050	1.0	0.100	4.30	4.75	0.45	8.00	
109		4.63	292.00	224.60	0.010	0.0050	1.0	0.100	4.40	4.75	0.35	6.00	6.00
					0.010	0.0050	1.0	0.100	4.75	5.10	0.35	6.00	
113	17	5.11	400.00	426.90	0.010	0.0050	1.0	0.100	5.20	5.60	0.40	7.00	6.50
					0.010	0.0050	1.0	0.100	5.60	5.95	0.35	6.00	
116		5.14	277.00	441.40	0.010	0.0050	1.0	0.100	5.50	5.90	0.40	7.00	7.00
					0.010	0.0050	1.0	0.100	5.90	6.30	0.40	7.00	
120	18	4.66	287.00	234.00	0.010	0.0050	1.0	0.100	7.80	8.15	0.35	6.00	6.50
					0.010	0.0050	1.0	0.100	8.15	8.55	0.40	7.00	
123		4.62	214.00	244.40	0.010	0.0050	1.0	0.100	0.00	0.15	0.15	2.00	2.00
					0.010	0.0050	1.0	0.100	0.00	0.00	0.00	0.00	
127	19	4.66	270.00	394.60	0.010	0.0050	1.0	0.100	5.95	6.30	0.35	6.00	6.00
					0.010	0.0050	1.0	0.100	6.30	6.65	0.35	6.00	
130		4.78	221.00	244.30	0.010	0.0050	1.0	0.100	7.40	7.70	0.30	5.00	5.50
					0.010	0.0050	1.0	0.100	7.70	8.05	0.35	6.00	
134	20	5.29	204.00	208.00	0.010	0.0050	1.0	0.100	7.25	7.65	0.40	7.00	6.00
					0.010	0.0050	1.0	0.100	7.65	7.95	0.30	5.00	
137		5.74	228.00	217.50	0.010	0.0050	1.0	0.100	5.75	6.10	0.35	6.00	6.00
					0.010	0.0050	1.0	0.100	6.10	6.45	0.35	6.00	
141	21	4.65	222.00	222.50	0.010	0.0050	1.0	0.100	8.50	8.80	0.30	5.00	5.00
					0.010	0.0050	1.0	0.100	-	-	-	-	
144		4.97	241.00	208.10	0.010	0.0050	1.0	0.100	6.00	6.40	0.40	7.00	7.00
					0.010	0.0050	1.0	0.100	-	-	-	-	

TKW-39

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	7.57	3040.00	108.00	0.001	0.0005	6.0	0.010	0.00	6.30	6.30	12.00	10.80
					0.001	0.0005	6.0	0.010	7.00	12.10	5.10	9.60	
4		7.63	3120.00	157.20	0.010	0.0050	0.3	0.001	0.00	20.00	20.00	3.70	3.67
					0.010	0.0050	0.3	0.001	2.60	22.30	19.70	3.64	
8	2	7.76	2470.00	36.60	0.010	0.0050	1.5	0.010	8.40	20.50	12.10	22.70	23.00
					0.010	0.0050	1.5	0.010	0.00	12.40	12.40	23.30	
11		7.21	2460.00	81.70	0.010	0.0050	1.0	0.010	7.60	22.50	14.90	28.80	27.10
					0.010	0.0050	1.0	0.010	0.00	13.20	13.20	25.40	
15	3	7.93	1312.00	28.90	0.010	0.0050	1.0	0.010	3.20	13.50	10.30	19.60	19.00
					0.010	0.0050	1.0	0.010	15.30	25.00	9.70	18.40	
18		7.72	302.00	78.90	0.010	0.0050	1.0	0.010	8.90	10.60	1.70	2.40	2.60
					0.010	0.0050	1.0	0.010	10.60	12.50	1.90	2.80	
22	4	8.04	1218.00	69.40	0.010	0.0050	1.0	0.010	15.40	28.80	13.40	25.80	25.90
					0.010	0.0050	1.0	0.010	0.00	13.50	13.50	26.00	
25		7.79	257.00	59.50	0.010	0.0050	1.0	0.010	10.30	12.10	1.80	2.60	2.40
					0.010	0.0050	1.0	0.010	12.10	13.70	1.60	2.20	
29	5	7.58	1197.00	221.40	0.010	0.0050	1.0	0.010	0.00	8.70	8.70	16.40	17.20
					0.010	0.0050	1.0	0.010	8.70	18.20	9.50	18.00	
32		7.17	1330.00	47.20	0.010	0.0050	1.0	0.010	0.00	11.00	11.00	21.00	20.80
					0.010	0.0050	1.0	0.010	4.90	15.70	10.80	20.60	
36	6	7.56	1068.00	281.10	0.010	0.0050	1.0	0.010	0.00	8.00	8.00	15.00	14.80
					0.010	0.0050	1.0	0.010	8.10	15.90	7.80	14.60	
39		6.76	1284.00	120.60	0.010	0.0050	1.0	0.010	0.00	8.60	8.60	16.20	17.30
					0.010	0.0050	1.0	0.010	8.60	18.30	9.70	18.40	
43	7	7.72	187.70	212.40	0.010	0.0050	1.0	0.010	0.00	4.70	4.70	8.40	9.00
					0.010	0.0050	1.0	0.010	4.70	10.00	5.30	9.60	
46		7.47	1286.00	148.90	0.010	0.0050	1.0	0.010	0.00	9.50	9.50	18.00	17.80
					0.010	0.0050	1.0	0.010	9.50	18.80	9.30	17.60	
50	8	7.78	935.00	95.10	0.010	0.0050	1.0	0.010	0.00	6.20	6.20	11.40	11.80
					0.010	0.0050	1.0	0.010	6.20	12.80	6.60	12.20	
53		7.14	1169.00	181.00	0.010	0.0050	1.0	0.100	1.30	1.90	0.60	11.00	10.00
					0.010	0.0050	1.0	0.100	1.90	2.40	0.50	9.00	
57	9	8.30	1053.00	263.20	0.010	0.0050	1.0	0.100	0.55	1.20	0.65	12.00	12.00
					0.010	0.0050	1.0	0.100	1.20	1.85	0.65	12.00	
60		7.15	893.00	158.80	0.010	0.0050	1.0	0.100	1.80	2.25	0.45	8.00	8.00
					0.010	0.0050	1.0	0.100	2.25	2.70	0.45	8.00	
64	10	7.77	890.00	139.10	0.010	0.0050	1.0	0.100	1.30	1.80	0.50	9.00	9.00
					0.010	0.0050	1.0	0.100	1.80	2.30	0.50	9.00	
67		7.70	1043.00	252.20	0.010	0.0050	1.0	0.100	0.80	1.40	0.60	11.00	10.50
					0.010	0.0050	1.0	0.100	1.40	1.95	0.55	10.00	
71	11	7.04	838.00	197.20	0.010	0.0050	1.0	0.100	2.60	3.00	0.40	7.00	7.50
					0.010	0.0050	1.0	0.100	3.00	3.45	0.45	8.00	
74		7.66	1049.00	110.50	0.010	0.0050	1.0	0.100	2.85	3.30	0.45	8.00	8.50
					0.010	0.0050	1.0	0.100	3.30	3.80	0.50	9.00	

TKW-39

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	7.59	779.00	244.30	0.010	0.0050	1.0	0.100	3.95	4.30	0.35	6.00	6.00
					0.010	0.0050	1.0	0.100	4.30	4.65	0.35	6.00	
81		7.59	803.00	286.00	0.010	0.0050	1.0	0.100	0.00	0.40	0.40	7.00	6.50
					0.010	0.0050	1.0	0.100	0.40	0.75	0.35	6.00	
85	13	8.06	724.00	298.90	0.010	0.0050	1.0	0.100	2.25	2.65	0.40	7.00	7.00
					0.010	0.0050	1.0	0.100	2.65	3.05	0.40	7.00	
88		7.77	853.00	232.70	0.010	0.0050	1.0	0.100	0.00	0.30	0.30	5.00	6.50
					0.010	0.0050	1.0	0.100	0.30	0.75	0.45	8.00	
92	14	8.20	743.00	148.30	0.010	0.0050	1.0	0.100	0.90	1.30	0.40	7.00	8.00
					0.010	0.0050	1.0	0.100	1.30	1.80	0.50	9.00	
95		7.85	921.00	181.90	0.010	0.0050	1.0	0.100	3.10	3.45	0.35	6.00	6.00
					0.010	0.0050	1.0	0.100	3.45	3.80	0.35	6.00	
99	15	8.13	739.00	202.90	0.010	0.0050	1.0	0.100	1.55	1.85	0.30	5.00	5.00
					0.010	0.0050	1.0	0.100	1.85	2.15	0.30	5.00	
102		6.98	853.00	191.70	0.010	0.0050	1.0	0.100	0.00	0.35	0.35	6.00	6.50
					0.010	0.0050	1.0	0.100	0.35	0.75	0.40	7.00	
106	16	7.26	779.00	209.60	0.010	0.0050	1.0	0.100	0.00	0.30	0.30	5.00	6.00
					0.010	0.0050	1.0	0.100	0.30	0.70	0.40	7.00	
109		7.55	889.00	187.80	0.010	0.0050	1.0	0.100	0.00	0.35	0.35	6.00	6.50
					0.010	0.0050	1.0	0.100	0.35	0.75	0.40	7.00	
113	17	7.48	793.00	185.30	0.010	0.0050	1.0	0.100	0.00	0.30	0.30	5.00	5.50
					0.010	0.0050	1.0	0.100	0.30	0.65	0.35	6.00	
116		7.49	841.00	216.00	0.010	0.0050	1.0	0.100	0.40	0.90	0.50	9.00	8.50
					0.010	0.0050	1.0	0.100	0.90	1.35	0.45	8.00	
120	18	7.33	707.00	182.20	0.010	0.0050	1.0	0.100	0.40	0.75	0.35	6.00	6.00
					0.010	0.0050	1.0	0.100	0.75	1.10	0.35	6.00	
123		7.33	845.00	207.20	0.010	0.0050	1.0	0.100	0.00	0.35	0.35	6.00	6.00
					0.010	0.0050	1.0	0.100	0.35	0.70	0.35	6.00	
127	19	6.86	613.00	185.30	0.010	0.0050	1.0	0.100	0.40	0.75	0.35	6.00	6.00
					0.010	0.0050	1.0	0.100	0.75	1.10	0.35	6.00	
130		7.56	1187.00	128.90	0.010	0.0050	1.0	0.100	1.00	1.35	0.35	6.00	6.50
					0.010	0.0050	1.0	0.100	1.35	1.75	0.40	7.00	
134	20	7.09	738.00	278.40	0.010	0.0050	1.0	0.100	3.25	3.60	0.35	6.00	6.00
					0.010	0.0050	1.0	0.100	3.60	3.95	0.35	6.00	
137		6.97	860.00	224.40	0.010	0.0050	1.0	0.100	0.00	0.35	0.35	6.00	7.00
					0.010	0.0050	1.0	0.100	0.35	0.80	0.45	8.00	
141	21	7.93	733.00	219.90	0.010	0.0050	1.0	0.100	2.70	3.05	0.35	6.00	5.00
					0.010	0.0050	1.0	0.100	3.05	3.30	0.25	4.00	
144		7.44	912.00	274.60	0.010	0.0050	1.0	0.100	6.40	6.80	0.40	7.00	7.50
					0.010	0.0050	1.0	0.100	6.80	7.25	0.45	8.00	

TKW-40

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	7.56	2620.00	165.40	0.001	0.0005	6.0	0.010	7.00	9.10	2.10	3.60	3.70
					0.001	0.0005	6.0	0.010	10.00	12.20	2.20	3.80	
4		6.68	1950.00	101.00	0.010	0.0050	0.3	0.001	0.00	9.40	9.40	1.58	1.56
					0.010	0.0050	0.3	0.001	9.40	18.60	9.20	1.54	
8	2	7.79	1749.00	91.20	0.010	0.0050	1.5	0.010	0.00	47.60	47.60	93.70	3.13
					0.010	0.0050	1.5	0.010	0.00	52.10	52.10	102.70	
11		7.81	1153.00	91.20	0.010	0.0050	1.0	0.010	6.50	10.90	4.40	7.80	4.70
					0.010	0.0050	1.0	0.010	15.90	17.20	1.30	1.60	
15	3	7.95	947.00	239.10	0.010	0.0050	1.0	0.010	14.50	17.50	3.00	5.00	4.80
					0.010	0.0050	1.0	0.010	17.50	20.30	2.80	4.60	
18		7.42	1067.00	85.20	0.010	0.0050	1.0	0.010	5.80	8.50	2.70	4.40	11.20
					0.010	0.0050	1.0	0.010	8.50	18.00	9.50	18.00	
22	4	7.88	843.00	111.40	0.010	0.0050	1.0	0.010	1.40	4.20	2.80	4.60	4.50
					0.010	0.0050	1.0	0.010	4.20	6.90	2.70	4.40	
25		7.88	949.00	86.30	0.010	0.0050	1.0	0.010	0.00	2.30	2.30	3.60	3.70
					0.010	0.0050	1.0	0.010	2.30	4.70	2.40	3.80	
29	5	7.48	779.00	227.50	0.010	0.0050	1.0	0.010	17.30	20.00	2.70	4.40	4.40
					0.010	0.0050	1.0	0.010	20.00	22.70	2.70	4.40	
32		7.98	834.00	196.70	0.010	0.0050	1.0	0.010	0.00	2.60	2.60	4.20	4.20
					0.010	0.0050	1.0	0.010	2.60	5.20	2.60	4.20	
36	6	7.66	1528.00	152.70	0.010	0.0050	1.0	0.010	2.30	4.20	1.90	2.80	2.90
					0.010	0.0050	1.0	0.010	4.20	6.20	2.00	3.00	
39		8.02	839.00	124.20	0.010	0.0050	1.0	0.010	15.50	17.90	2.40	3.80	3.80
					0.010	0.0050	1.0	0.010	17.90	20.30	2.40	3.80	
43	7	8.31	138.00	172.30	0.010	0.0050	1.0	0.010	13.30	14.50	1.20	1.40	1.50
					0.010	0.0050	1.0	0.010	14.50	15.80	1.30	1.60	
46		8.00	597.00	330.00	0.010	0.0050	1.0	0.010	9.10	11.00	1.90	2.80	3.20
					0.010	0.0050	1.0	0.010	11.00	13.30	2.30	3.60	
50	8	6.23	716.00	206.70	0.010	0.0050	1.0	0.010	3.00	5.30	2.30	3.60	4.00
					0.010	0.0050	1.0	0.010	5.30	8.00	2.70	4.40	
53		7.85	605.00	265.10	0.010	0.0050	1.0	0.010	0.00	2.60	2.60	4.20	3.90
					0.010	0.0050	1.0	0.010	2.60	4.90	2.30	3.60	
57	9	7.37	679.00	425.80	0.010	0.0050	1.0	0.010	2.40	2.70	0.30	-0.40	-0.04
					0.010	0.0050	1.0	0.100	-	-	-	-1.00	
60		7.79	537.00	308.40	0.010	0.0050	1.0	0.100	3.85	4.15	0.30	5.00	2.50
					0.010	0.0050	1.0	0.100	4.15	4.40	0.25	4.00	
64	10	7.83	424.00	182.80	0.010	0.0050	1.0	0.100	1.30	1.55	0.25	4.00	2.00
					0.010	0.0050	1.0	0.100	1.55	1.80	0.25	4.00	
67		7.87	446.00	209.70	0.010	0.0050	1.0	0.100	0.00	0.20	0.20	3.00	1.50
					0.010	0.0050	1.0	0.100	0.20	0.45	0.25	4.00	
71	11	7.93	393.00	278.60	0.010	0.0050	1.0	0.100	1.70	2.00	0.30	5.00	2.50
					0.010	0.0050	1.0	0.100	2.00	2.20	0.20	3.00	
74		8.24	437.00	272.50	0.010	0.0050	1.0	0.100	1.75	2.10	0.35	6.00	3.00
					0.010	0.0050	1.0	0.100	2.10	2.40	0.30	5.00	

TKW-40

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	7.86	322.00	158.50	0.010	0.0050	1.0	0.100	3.05	3.30	0.25	4.00	2.00
					0.010	0.0050	1.0	0.100	3.30	3.50	0.20	3.00	
81		8.05	307.00	525.70	0.010	0.0050	1.0	0.100	2.50	2.70	0.20	3.00	1.50
					0.010	0.0050	1.0	0.100	2.70	2.95	0.25	4.00	
85	13	8.21	273.00	188.10	0.010	0.0050	1.0	0.100	4.40	4.65	0.25	4.00	2.00
					0.010	0.0050	1.0	0.100	4.65	4.90	0.25	4.00	
88		7.42	289.00	232.70	0.010	0.0050	1.0	0.100	0.75	1.00	0.25	4.00	2.00
					0.010	0.0050	1.0	0.100	1.00	1.30	0.30	5.00	
92	14	8.15	287.00	191.00	0.010	0.0050	1.0	0.100	0.00	0.20	0.20	3.00	1.50
					0.010	0.0050	1.0	0.100	0.20	0.45	0.25	4.00	
95		7.57	339.00	177.80	0.010	0.0050	1.0	0.100	4.20	4.45	0.25	4.00	2.00
					0.010	0.0050	1.0	0.100	4.45	4.70	0.25	4.00	
99	15	7.54	319.00	249.90	0.010	0.0050	1.0	0.100	2.15	2.40	0.25	4.00	2.00
					0.010	0.0050	1.0	0.100	2.40	2.65	0.25	4.00	
102		6.35	338.00	266.60	0.010	0.0050	1.0	0.100	1.30	1.55	0.25	4.00	2.00
					0.010	0.0050	1.0	0.100	1.55	1.85	0.30	5.00	
106	16	6.12	313.00	273.40	0.010	0.0050	1.0	0.100	2.35	2.65	0.30	5.00	2.50
					0.010	0.0050	1.0	0.100	2.65	2.95	0.30	5.00	
109		5.61	375.00	278.70	0.010	0.0050	1.0	0.100	0.75	1.05	0.30	5.00	2.50
					0.010	0.0050	1.0	0.100	1.05	1.40	0.35	6.00	
113	17	5.47	349.00	286.00	0.010	0.0050	1.0	0.100	0.65	1.05	0.40	7.00	3.50
					0.010	0.0050	1.0	0.100	1.05	1.45	0.40	7.00	
116		5.15	395.00	306.80	0.010	0.0050	1.0	0.100	2.25	2.65	0.40	7.00	3.50
					0.010	0.0050	1.0	0.100	2.65	3.10	0.45	8.00	
120	18	5.47	392.00	285.30	0.010	0.0050	1.0	0.100	2.40	2.85	0.45	8.00	4.00
					0.010	0.0050	1.0	0.100	2.85	3.25	0.40	7.00	
123		5.40	461.00	297.90	0.010	0.0050	1.0	0.100	2.40	2.80	0.40	7.00	3.50
					0.010	0.0050	1.0	0.100	2.80	3.20	0.40	7.00	
127	19	5.48	391.00	285.20	0.010	0.0050	1.0	0.100	2.40	2.80	0.40	7.00	3.50
					0.010	0.0050	1.0	0.100	2.80	3.25	0.45	8.00	
130		5.59	568.00	502.60	0.010	0.0050	1.0	0.100	0.00	0.55	0.55	10.00	5.00
					0.010	0.0050	1.0	0.100	0.55	1.00	0.45	8.00	
134	20	5.56	463.00	372.10	0.010	0.0050	1.0	0.100	1.00	1.40	0.40	7.00	3.50
					0.010	0.0050	1.0	0.100	1.40	1.95	0.55	10.00	
137		5.19	524.00	299.70	0.010	0.0050	1.0	0.100	0.80	1.30	0.50	9.00	4.50
					0.010	0.0050	1.0	0.100	1.30	1.80	0.50	9.00	
141	21	5.54	465.00	282.10	0.010	0.0050	1.0	0.100	3.75	4.15	0.40	7.00	3.50
					0.010	0.0050	1.0	0.100	4.15	4.60	0.45	8.00	
144		5.59	581.00	401.20	0.010	0.0050	1.0	0.100	4.25	4.70	0.45	8.00	4.00
					0.010	0.0050	1.0	0.100	4.70	5.15	0.45	8.00	

TKW-41

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	7.6	669.00	81.60	0.001	0.0005	7.0	0.001	0.00	0.90	0.90	-0.52	0.00
					0.001	0.0005	7.0	0.001	1.00	2.00	1.00	-0.50	
4		8.1	249.00	7.76	0.010	0.0050	0.3	0.001	12.30	16.30	4.00	0.50	0.53
					0.010	0.0050	0.3	0.001	16.30	20.60	4.30	0.56	
8	2	8.3	168.20	59.60	0.010	0.0050	1.5	0.010	2.60	4.60	2.00	2.50	2.50
					0.010	0.0050	1.5	0.010	4.60	6.60	2.00	2.50	
11		7.9	158.50	95.50	0.010	0.0050	1.0	0.010	10.80	12.10	1.30	1.60	1.60
					0.010	0.0050	1.0	0.010	15.90	17.20	1.30	1.60	
15	3	7.7	193.70	128.80	0.010	0.0050	1.0	0.010	0.00	1.10	1.10	1.20	1.20
					0.010	0.0050	1.0	0.010	1.10	2.20	1.10	1.20	
18		8.3	160.00	71.30	0.010	0.0050	1.0	0.010	16.30	18.00	1.70	2.40	2.50
					0.010	0.0050	1.0	0.010	18.00	19.80	1.80	2.60	
22	4	8.6	144.70	79.40	0.010	0.0050	1.0	0.010	4.60	6.10	1.50	2.00	2.50
					0.010	0.0050	1.0	0.010	6.10	8.10	2.00	3.00	
25		7.8	146.40	90.20	0.010	0.0050	1.0	0.010	3.70	5.10	1.40	1.80	1.80
					0.010	0.0050	1.0	0.010	5.10	6.50	1.40	1.80	
29	5	8.4	150.70	150.00	0.010	0.0050	1.0	0.010	8.00	9.30	1.30	1.60	1.60
					0.010	0.0050	1.0	0.010	9.30	10.60	1.30	1.60	
32		8.2	157.60	89.50	0.010	0.0050	1.0	0.010	15.70	17.30	1.60	2.20	2.10
					0.010	0.0050	1.0	0.010	17.30	18.80	1.50	2.00	
36	6	8.5	147.10	271.60	0.010	0.0050	1.0	0.010	6.20	7.80	1.60	2.20	2.00
					0.010	0.0050	1.0	0.010	7.80	9.20	1.40	1.80	
39		7.6	147.20	489.50	0.010	0.0050	1.0	0.010	18.70	24.20	5.50	10.00	4.50
					0.010	0.0050	1.0	0.010	0.00	0.00	0.00	-1.00	
43	7	7.7	155.80	219.10	0.010	0.0050	1.0	0.010	4.20	5.90	1.70	2.40	2.50
					0.010	0.0050	1.0	0.010	5.90	7.70	1.80	2.60	
46		7.7	177.60	193.00	0.010	0.0050	1.0	0.010	13.90	15.70	1.80	2.60	2.60
					0.010	0.0050	1.0	0.010	15.70	17.50	1.80	2.60	
50	8	7.9	171.90	123.20	0.010	0.0050	1.0	0.010	16.20	18.10	1.90	2.80	1.90
					0.010	0.0050	1.0	0.010	18.10	19.10	1.00	1.00	
53		8.2	161.70	235.90	0.010	0.0050	1.0	0.100	0.00	0.20	0.20	3.00	3.00
					0.010	0.0050	1.0	0.100	0.20	0.40	0.20	3.00	
57	9	8.0	151.50	312.00	0.010	0.0050	1.0	0.100	5.65	5.80	0.15	2.00	3.00
					0.010	0.0050	1.0	0.100	5.80	6.05	0.25	4.00	
60		8.2	141.75	171.80	0.010	0.0050	1.0	0.100	0.00	0.25	0.25	4.00	3.50
					0.010	0.0050	1.0	0.100	0.25	0.45	0.20	3.00	
64	10	8.1	132.00	155.60	0.010	0.0050	1.0	0.100	0.85	1.05	0.20	3.00	3.50
					0.010	0.0050	1.0	0.100	1.05	1.30	0.25	4.00	
67		7.9	152.20	115.60	0.010	0.0050	1.0	0.100	2.40	2.60	0.20	3.00	3.00
					0.010	0.0050	1.0	0.100	2.60	2.80	0.20	3.00	
71	11	7.2	134.10	168.90	0.010	0.0050	1.0	0.100	1.30	1.50	0.20	3.00	3.00
					0.010	0.0050	1.0	0.100	1.50	1.70	0.20	3.00	
74		7.9	177.50	84.40	0.010	0.0050	1.0	0.100	0.00	0.20	0.20	3.00	3.00
					0.010	0.0050	1.0	0.100	0.20	0.40	0.20	3.00	

TKW-41

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	8.4	132.10	149.10	0.010	0.0050	1.0	0.100	0.00	0.20	0.20	3.00	4.00
					0.010	0.0050	1.0	0.100	0.20	0.50	0.30	5.00	
81		8.3	141.80	299.10	0.010	0.0050	1.0	0.100	3.90	4.15	0.25	4.00	4.00
					0.010	0.0050	1.0	0.100	4.15	4.40	0.25	4.00	
85	13	8.2	144.20	178.70	0.010	0.0050	1.0	0.100	4.00	4.20	0.20	3.00	3.00
					0.010	0.0050	1.0	0.100	4.20	4.40	0.20	3.00	
88		8.0	150.00	187.70	0.010	0.0050	1.0	0.100	2.40	2.65	0.25	4.00	4.00
					0.010	0.0050	1.0	0.100	2.65	2.90	0.25	4.00	
92	14	8.3	146.70	153.00	0.010	0.0050	1.0	0.100	2.20	2.40	0.20	3.00	3.00
					0.010	0.0050	1.0	0.100	2.40	2.60	0.20	3.00	
95		8.2	159.40	202.80	0.010	0.0050	1.0	0.100	2.65	2.90	0.25	4.00	3.50
					0.010	0.0050	1.0	0.100	2.90	3.10	0.20	3.00	
99	15	8.3	164.20	285.90	0.010	0.0050	1.0	0.100	0.80	1.00	0.20	3.00	2.50
					0.010	0.0050	1.0	0.100	1.00	1.15	0.15	2.00	
102		7.7	154.10	215.60	0.010	0.0050	1.0	0.100	2.60	2.85	0.25	4.00	3.50
					0.010	0.0050	1.0	0.100	2.85	3.05	0.20	3.00	
106	16	8.1	157.10	213.40	0.010	0.0050	1.0	0.100	3.85	4.00	0.15	2.00	2.50
					0.010	0.0050	1.0	0.100	4.00	4.20	0.20	3.00	
109		7.8	164.70	196.80	0.010	0.0050	1.0	0.100	1.80	2.05	0.25	4.00	3.50
					0.010	0.0050	1.0	0.100	2.05	2.25	0.20	3.00	
113	17	8.2	161.20	194.30	0.010	0.0050	1.0	0.100	1.90	2.10	0.20	3.00	2.50
					0.010	0.0050	1.0	0.100	2.10	2.25	0.15	2.00	
116		8.0	141.10	229.10	0.010	0.0050	1.0	0.100	1.35	1.55	0.20	3.00	3.50
					0.010	0.0050	1.0	0.100	1.55	1.80	0.25	4.00	
120	18	7.9	149.70	185.70	0.010	0.0050	1.0	0.100	1.55	1.80	0.25	4.00	3.50
					0.010	0.0050	1.0	0.100	1.80	2.00	0.20	3.00	
123		8.0	149.60	217.10	0.010	0.0050	1.0	0.100	2.00	2.20	0.20	3.00	3.00
					0.010	0.0050	1.0	0.100	2.20	2.40	0.20	3.00	
127	19	7.1	138.90	195.90	0.010	0.0050	1.0	0.100	0.00	0.20	0.20	3.00	3.00
					0.010	0.0050	1.0	0.100	0.20	0.40	0.20	3.00	
130		8.4	156.70	227.30	0.010	0.0050	1.0	0.100	3.75	4.00	0.25	4.00	4.00
					0.010	0.0050	1.0	0.100	4.00	4.25	0.25	4.00	
134	20	8.1	137.30	318.10	0.010	0.0050	1.0	0.100	2.35	2.60	0.25	4.00	3.50
					0.010	0.0050	1.0	0.100	2.60	2.80	0.20	3.00	
137		7.7	146.10	256.30	0.010	0.0050	1.0	0.100	2.30	2.50	0.20	3.00	3.00
					0.010	0.0050	1.0	0.100	2.50	2.70	0.20	3.00	
141	21	8.3	150.60	236.40	0.010	0.0050	1.0	0.100	2.30	2.50	0.20	3.00	3.00
					0.010	0.0050	1.0	0.100	2.50	2.70	0.20	3.00	
144		6.9	136.80	337.00	0.010	0.0050	1.0	0.100	5.15	5.30	0.15	2.00	2.50
					0.010	0.0050	1.0	0.100	5.30	5.50	0.20	3.00	

TKW-44

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	7.6	1709.00	83.80	0.001	0.0005	6	0.010	3.00	4.50	1.50	2.40	2.40
					0.001	0.0005	6	0.010	5.00	6.50	1.50	2.40	
4		7.6	663.00	123.00	0.001	0.0005	10	0.001	18.60	23.90	5.30	0.06	0.09
					0.001	0.0005	10	0.001	0.00	5.60	5.60	0.12	
8	2	7.3	2750.00	274.70	0.010	0.0050	2	0.010	4.90	8.20	3.30	4.60	4.60
					0.010	0.0050	2	0.010	8.20	11.50	3.30	4.60	
11		7.8	374.00	90.09	0.010	0.0050	1.5	0.010	21.60	24.10	2.50	3.50	4.50
					0.010	0.0050	1.5	0.010	0.00	3.50	3.50	5.50	
15	3	8.2	323.00	86.90	0.010	0.0050	1	0.010	3.60	5.60	2.00	3.00	2.70
					0.010	0.0050	1	0.010	5.60	7.30	1.70	2.40	
18		7.2	356.00	131.80	0.010	0.0050	1	0.010	0.00	2.40	2.40	3.80	3.80
					0.010	0.0050	1	0.010	2.40	4.80	2.40	3.80	
22	4	8.2	320.00	130.80	0.010	0.0050	1	0.010	0.00	2.30	2.30	3.60	3.50
					0.010	0.0050	1	0.010	2.30	4.50	2.20	3.40	
25		7.5	362.00	46.50	0.010	0.0050	1	0.010	4.70	6.70	2.00	3.00	3.00
					0.010	0.0050	1	0.010	6.70	8.70	2.00	3.00	
29	5	7.5	345.00	206.00	0.010	0.0050	1	0.010	14.10	15.80	1.70	2.40	2.20
					0.010	0.0050	1	0.010	15.80	17.30	1.50	2.00	
32		8.0	412.00	399.00	0.010	0.0050	1	0.010	16.10	17.60	1.50	2.00	2.00
					0.010	0.0050	1	0.010	17.60	19.10	1.50	2.00	
36	6	8.1	333.00	267.80	0.010	0.0050	1	0.010	9.20	10.60	1.40	1.80	1.80
					0.010	0.0050	1	0.010	10.60	12.00	1.40	1.80	
39		7.5	384.00	184.80	0.010	0.0050	1	0.010	13.80	15.30	1.50	2.00	2.10
					0.010	0.0050	1	0.010	15.30	16.90	1.60	2.20	
43	7	8.1	289.00	229.40	0.010	0.0050	1	0.010	0.70	2.40	1.70	2.40	2.20
					0.010	0.0050	1	0.010	9.20	10.70	1.50	2.00	
46		8.2	350.00	208.60	0.010	0.0050	1	0.010	10.90	12.40	1.50	2.00	2.00
					0.010	0.0050	1	0.010	12.40	13.90	1.50	2.00	
50	8	7.8	313.00	139.30	0.010	0.0050	1	0.010	19.90	21.80	1.90	2.80	2.60
					0.010	0.0050	1	0.010	21.80	23.50	1.70	2.40	
53		7.8	363.00	203.10	0.010	0.0050	1	0.100	3.20	3.50	0.30	5.00	4.00
					0.010	0.0050	1	0.100	3.50	3.70	0.20	3.00	
57	9	7.9	106.90	307.70	0.010	0.0050	1	0.100	0.00	0.35	0.35	6.00	4.50
					0.010	0.0050	1	0.100	0.35	0.55	0.20	3.00	
60		7.7	233.00	163.50	0.010	0.0050	1	0.100	0.45	0.65	0.20	3.00	3.00
					0.010	0.0050	1	0.100	0.65	0.85	0.20	3.00	
64	10	8.1	256.00	206.00	0.010	0.0050	1	0.100	0.45	0.65	0.20	3.00	3.00
					0.010	0.0050	1	0.100	0.65	0.85	0.20	3.00	
67		8.4	285.00	123.30	0.010	0.0050	1	0.100	0.00	0.20	0.20	3.00	3.00
					0.010	0.0050	1	0.100	0.20	0.40	0.20	3.00	
71	11	7.3	222.00	219.20	0.010	0.0050	1	0.100	0.00	0.20	0.20	3.00	3.00
					0.010	0.0050	1	0.100	0.20	0.40	0.20	3.00	
74		8.1	260.00	88.90	0.010	0.0050	1	0.100	3.80	4.00	0.20	3.00	4.00
					0.010	0.0050	1	0.100	4.00	4.30	0.30	5.00	

TKW-44

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	8.1	207.00	150.20	0.010	0.0050	1	0.100	1.20	1.40	0.20	3.00	4.00
					0.010	0.0050	1	0.100	1.40	1.70	0.30	5.00	
81		8.2	209.00	303.70	0.010	0.0050	1	0.100	3.45	3.65	0.20	3.00	3.50
					0.010	0.0050	1	0.100	3.65	3.90	0.25	4.00	
85	13	8.3	245.00	344.00	0.010	0.0050	1	0.100	0.00	0.20	0.20	3.00	3.00
					0.010	0.0050	1	0.100	0.20	0.40	0.20	3.00	
88		8.3	214.00	252.60	0.010	0.0050	1	0.100	1.65	1.85	0.20	3.00	3.00
					0.010	0.0050	1	0.100	1.85	2.05	0.20	3.00	
92	14	8.4	194.20	179.10	0.010	0.0050	1	0.100	3.00	3.20	0.20	3.00	3.50
					0.010	0.0050	1	0.100	3.20	3.45	0.25	4.00	
95		8.1	227.00	202.80	0.010	0.0050	1	0.100	1.75	1.95	0.20	3.00	2.50
					0.010	0.0050	1	0.100	1.95	2.10	0.15	2.00	
99	15	8.1	195.00	236.60	0.010	0.0050	1	0.100	3.50	3.70	0.20	3.00	3.00
					0.010	0.0050	1	0.100	3.70	3.90	0.20	3.00	
102		7.9	204.00	221.90	0.010	0.0050	1	0.100	4.40	4.60	0.20	3.00	2.50
					0.010	0.0050	1	0.100	4.60	4.75	0.15	2.00	
106	16	8.1	194.70	218.30	0.010	0.0050	1	0.100	4.20	4.40	0.20	3.00	3.00
					0.010	0.0050	1	0.100	4.40	4.60	0.20	3.00	
109		7.9	204.00	198.40	0.010	0.0050	1	0.100	2.70	2.90	0.20	3.00	3.00
					0.010	0.0050	1	0.100	2.90	3.10	0.20	3.00	
113	17	7.9	214.00	207.00	0.010	0.0050	1	0.100	1.45	1.65	0.20	3.00	3.50
					0.010	0.0050	1	0.100	1.65	1.90	0.25	4.00	
116		7.4	230.00	224.40	0.010	0.0050	1	0.100	0.00	0.15	0.15	2.00	3.00
					0.010	0.0050	1	0.100	0.15	0.40	0.25	4.00	
120	18	7.7	179.40	186.60	0.010	0.0050	1	0.100	1.10	1.30	0.20	3.00	3.50
					0.010	0.0050	1	0.100	1.30	1.55	0.25	4.00	
123		7.7	152.30	216.10	0.010	0.0050	1	0.100	1.20	1.40	0.20	3.00	3.00
					0.010	0.0050	1	0.100	1.40	1.60	0.20	3.00	
127	19	7.3	169.30	199.80	0.010	0.0050	1	0.100	1.10	1.30	0.20	3.00	3.00
					0.010	0.0050	1	0.100	1.30	1.50	0.20	3.00	
130		8.2	219.00	200.90	0.010	0.0050	1	0.100	2.60	2.80	0.20	3.00	3.00
					0.010	0.0050	1	0.100	2.80	3.00	0.20	3.00	
134	20	8.1	167.30	323.80	0.010	0.0050	1	0.100	2.80	3.00	0.20	3.00	3.50
					0.010	0.0050	1	0.100	3.00	3.25	0.25	4.00	
137		8.1	186.70	259.70	0.010	0.0050	1	0.100	3.50	3.70	0.20	3.00	3.00
					0.010	0.0050	1	0.100	3.70	3.90	0.20	3.00	
141	21	8.0	179.70	229.50	0.010	0.0050	1	0.100	1.40	1.60	0.20	3.00	3.00
					0.010	0.0050	1	0.100	1.60	1.80	0.20	3.00	
144		8.0	151.90	333.50	0.010	0.0050	1	0.100	5.50	5.70	0.20	3.00	3.50
					0.010	0.0050	1	0.100	5.70	5.95	0.25	4.00	

TKW-46

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
1	1	8.0	394.00	62.60	0.001	0.0005	6.0	0.01	8.00	8.50	0.50	0.40	0.64
					0.001	0.0005	6.0	0.00	0.00	7.40	7.40	0.88	
4		7.6	174.00	94.80	0.010	0.0050	0.3	0.00	9.20	14.30	5.10	0.72	0.69
					0.010	0.0050	0.3	0.00	14.30	19.10	4.80	0.66	
8	2	7.1	131.60	186.60	0.010	0.0050	1.5	0.01	17.20	19.40	2.20	2.90	2.90
					0.010	0.0050	1.5	0.01	19.40	21.60	2.20	2.90	
11		7.0	113.80	191.70	0.010	0.0050	1.0	0.01	0.00	1.60	1.60	2.20	2.20
					0.010	0.0050	1.0	0.01	1.60	3.20	1.60	2.20	
15	3	8.3	85.00	89.10	0.010	0.0050	1.0	0.01	2.30	3.70	1.40	1.80	1.90
					0.010	0.0050	1.0	0.01	3.70	5.20	1.50	2.00	
18		7.2	356.00	131.80	0.010	0.0050	1.0	0.01	0.00	2.40	2.40	3.80	3.80
					0.010	0.0050	1.0	0.01	2.40	4.80	2.40	3.80	
22	4	7.5	84.00	109.80	0.010	0.0050	1.0	0.01	10.10	12.20	2.10	3.20	3.40
					0.010	0.0050	1.0	0.01	12.20	14.50	2.30	3.60	
25		7.1	82.00	75.10	0.010	0.0050	1.0	0.01	6.50	8.40	1.90	2.80	2.70
					0.010	0.0050	1.0	0.01	8.40	10.20	1.80	2.60	
29	5	7.7	76.50	221.50	0.010	0.0050	1.0	0.01	10.60	12.30	1.70	2.40	2.50
					0.010	0.0050	1.0	0.01	12.30	14.10	1.80	2.60	
32		7.3	84.60	262.20	0.010	0.0050	1.0	0.01	15.40	17.10	1.70	2.40	2.40
					0.010	0.0050	1.0	0.01	17.10	18.80	1.70	2.40	
36	6	7.9	74.80	278.11	0.010	0.0050	1.0	0.01	12.00	13.80	1.80	2.60	2.50
					0.010	0.0050	1.0	0.01	13.80	15.50	1.70	2.40	
39		6.6	7.79	65.30	0.010	0.0050	1.0	0.01	10.60	12.70	2.10	3.20	3.20
					0.010	0.0050	1.0	0.01	12.70	14.80	2.10	3.20	
43	7	8.5	68.60	343.30	0.010	0.0050	1.0	0.01	0.00	2.10	2.10	3.20	3.20
					0.010	0.0050	1.0	0.01	2.10	4.20	2.10	3.20	
46		8.2	72.70	218.20	0.010	0.0050	1.0	0.01	20.30	22.30	2.00	3.00	2.90
					0.010	0.0050	1.0	0.01	22.30	24.20	1.90	2.80	
50	8	8.1	7.1.3	283.90	0.010	0.0050	1.0	0.01	0.00	2.10	2.10	3.20	3.60
					0.010	0.0050	1.0	0.01	2.10	4.60	2.50	4.00	
53		6.3	61.90	216.70	0.010	0.0050	1.0	0.10	3.70	3.90	0.20	3.00	4.00
					0.010	0.0050	1.0	0.10	3.90	4.20	0.30	5.00	
57	9	7.4	58.00	296.00	0.010	0.0050	1.0	0.10	2.25	2.50	0.25	4.00	4.00
					0.010	0.0050	1.0	0.10	2.50	2.75	0.25	4.00	
60		7.1	44.90	136.50	0.010	0.0050	1.0	0.10	2.70	2.95	0.25	4.00	4.00
					0.010	0.0050	1.0	0.10	2.95	3.20	0.25	4.00	
64	10	8.0	67.60	156.60	0.010	0.0050	1.0	0.10	2.30	2.50	0.20	3.00	3.50
					0.010	0.0050	1.0	0.10	2.50	2.75	0.25	4.00	
67		8.2	67.10	253.00	0.010	0.0050	1.0	0.10	3.70	3.85	0.15	2.00	3.50
					0.010	0.0050	1.0	0.10	3.85	4.15	0.30	5.00	
71	11	8.1	56.50	262.40	0.010	0.0050	1.0	0.10	3.90	4.15	0.25	4.00	4.50
					0.010	0.0050	1.0	0.10	4.15	4.45	0.30	5.00	
74		8.3	65.20	110.30	0.010	0.0050	1.0	0.10	0.40	0.65	0.25	4.00	4.50
					0.010	0.0050	1.0	0.10	0.65	0.95	0.30	5.00	

TKW-46

Days	Cycle no.	pH	EC (μS/cm)	Eh (mV)	Titration						Diff.	Acidity (meq/L)	Acidity (meq/L) (avr.)
					H_2SO_4 (M)	H_2SO_4 (N)	H_2SO_4 (mL)	NaOH (N)	Start	End			
78	12	7.6	89.70	140.40	0.010	0.0050	1.0	0.10	2.55	2.80	0.25	4.00	4.00
					0.010	0.0050	1.0	0.10	2.80	3.05	0.25	4.00	
81		8.0	63.20	283.80	0.010	0.0050	1.0	0.10	0.75	1.00	0.25	4.00	4.00
					0.010	0.0050	1.0	0.10	1.00	1.25	0.25	4.00	
85	13	8.6	60.60	159.20	0.010	0.0050	1.0	0.10	1.30	1.60	0.30	5.00	4.50
					0.010	0.0050	1.0	0.10	1.60	1.85	0.25	4.00	
88		8.1	54.80	234.40	0.010	0.0050	1.0	0.10	2.90	3.15	0.25	4.00	4.00
					0.010	0.0050	1.0	0.10	3.15	3.40	0.25	4.00	
92	14	8.6	77.40	160.80	0.010	0.0050	1.0	0.10	0.45	0.70	0.25	4.00	3.50
					0.010	0.0050	1.0	0.10	0.70	0.90	0.20	3.00	
95		7.9	64.70	203.90	0.010	0.0050	1.0	0.10	4.70	4.90	0.20	3.00	3.50
					0.010	0.0050	1.0	0.10	4.90	5.15	0.25	4.00	
99	15	7.4	61.80	228.00	0.010	0.0050	1.0	0.10	3.90	4.15	0.25	4.00	3.50
					0.010	0.0050	1.0	0.10	4.15	4.35	0.20	3.00	
102		7.5	57.60	211.50	0.010	0.0050	1.0	0.10	0.75	1.00	0.25	4.00	4.50
					0.010	0.0050	1.0	0.10	1.00	1.30	0.30	5.00	
106	16	7.3	60.60	211.90	0.010	0.0050	1.0	0.10	2.95	3.20	0.25	4.00	4.00
					0.010	0.0050	1.0	0.10	3.20	3.45	0.25	4.00	
109		8.2	56.40	193.40	0.010	0.0050	1.0	0.10	3.50	3.75	0.25	4.00	4.50
					0.010	0.0050	1.0	0.10	3.75	4.05	0.30	5.00	
113	17	8.4	33.40	213.60	0.010	0.0050	1.0	0.10	3.10	3.35	0.25	4.00	4.00
					0.010	0.0050	1.0	0.10	3.35	3.60	0.25	4.00	
116		7.2	62.90	236.40	0.010	0.0050	1.0	0.10	3.10	3.35	0.25	4.00	4.00
					0.010	0.0050	1.0	0.10	3.35	3.60	0.25	4.00	
120	18	8.2	56.10	204.70	0.010	0.0050	1.0	0.10	4.05	4.30	0.25	4.00	1.00
					0.010	0.0050	1.0	0.10	4.60	4.55	-0.05	-2.00	
123		7.7	33.30	202.00	0.010	0.0050	1.0	0.10	0.70	0.95	0.25	4.00	4.00
					0.010	0.0050	1.0	0.10	0.95	1.20	0.25	4.00	
127	19	7.5	49.10	183.00	0.010	0.0050	1.0	0.10	1.50	1.75	0.25	4.00	4.00
					0.010	0.0050	1.0	0.10	1.75	2.00	0.25	4.00	
130		8.4	54.90	185.50	0.010	0.0050	1.0	0.10	2.20	2.40	0.20	3.00	3.00
					0.010	0.0050	1.0	0.10	2.40	2.60	0.20	3.00	
134	20	8.3	52.10	277.90	0.010	0.0050	1.0	0.10	3.95	4.20	0.25	4.00	3.70
					0.010	0.0050	1.0	0.10	4.20	4.42	0.22	3.40	
137		7.0	51.60	238.30	0.010	0.0050	1.0	0.10	1.80	2.05	0.25	4.00	4.00
					0.010	0.0050	1.0	0.10	2.05	2.30	0.25	4.00	
141	21	8.2	49.30	228.60	0.010	0.0050	1.0	0.10	3.30	3.55	0.25	4.00	3.50
					0.010	0.0050	1.0	0.10	3.55	3.75	0.20	3.00	
144		8.1	44.30	323.00	0.010	0.0050	1.0	0.10	5.95	6.15	0.20	3.00	3.50
					0.010	0.0050	1.0	0.10	6.15	6.40	0.25	4.00	

APPENDIX B

Heavy metal concentration obtained from weathering cell test (analyzed by ICP-OES)

TKW-2

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.079	0.325	3.937	0.018	0.029	0.078	0.110	0.079	0.151
4		0.066	0.133	1.151	0.018	0.023	0.068	0.047	0.079	0.021
8	2	0.063	0.063	3.353	0.017	0.026	0.111	0.115	0.081	13.178
11		0.079	0.101	2.630	0.017	0.016	0.068	0.113	0.081	10.730
15	3	0.063	0.067	2.701	0.017	0.019	0.106	0.062	0.080	11.224
18		0.061	0.056	2.693	0.017	0.013	0.038	0.117	0.080	10.699
22	4	0.062	0.061	2.774	0.018	0.032	0.072	0.037	0.081	9.881
25		0.066	0.101	2.758	0.018	0.015	0.048	0.124	0.080	11.682
29	5	0.074	0.061	2.164	0.017	0.023	0.035	0.076	0.080	10.146
32		0.068	0.057	2.584	0.017	0.012	0.026	0.125	0.080	10.820
36	6	0.074	0.060	2.573	0.017	0.031	0.027	0.042	0.015	10.143
39		0.063	0.056	2.584	0.018	0.009	0.032	0.004	0.014	10.186
43	7	0.081	0.068	2.887	0.017	0.026	0.038	0.030	0.015	9.438
46		0.058	0.058	2.710	0.017	0.025	0.033	0.015	0.014	9.843
50	8	0.065	0.114	2.876	0.017	0.014	0.037	0.008	0.015	9.694
53		0.079	0.054	2.631	0.017	0.019	0.037	0.220	0.016	9.438
57	9	0.071	0.055	2.735	0.014	0.031	0.034	0.003	0.016	10.169
60		0.073	0.054	2.811	0.017	0.018	0.037	0.031	0.015	10.186
64	10	0.071	0.156	2.092	0.017	0.013	0.035	0.028	0.016	9.744
67		0.072	0.053	2.387	0.017	0.016	0.031	0.013	0.015	9.718
71	11	0.075	0.060	2.097	0.017	0.025	0.034	0.010	0.015	9.181
74		0.067	0.052	1.815	0.017	0.013	0.044	0.020	0.015	8.048
78	12	0.069	0.075	1.859	0.018	0.020	0.081	0.037	0.014	8.408
81		0.081	0.055	1.816	0.019	0.015	0.033	0.027	0.013	8.728
85	13	0.063	0.076	1.655	0.018	0.022	0.030	0.023	0.015	7.662
88		0.071	0.054	2.214	0.018	0.017	0.050	0.022	0.016	9.278
92	14	0.077	0.052	2.192	0.017	0.022	0.045	0.039	0.016	9.324
95		0.072	0.072	2.280	0.018	0.016	0.067	0.021	0.014	13.254
99	15	0.061	0.062	2.244	0.017	0.015	0.038	0.022	0.016	8.639
102		0.065	0.059	2.446	0.017	0.013	0.128	0.039	0.014	9.226
106	16	0.095	0.088	2.366	0.018	0.029	0.047	0.041	0.016	8.032
109		0.064	0.064	2.398	0.018	0.018	0.043	0.025	0.015	8.350
113	17	0.068	0.055	2.212	0.017	0.020	0.037	0.021	0.015	8.668
116		0.059	0.053	2.375	0.017	0.019	0.046	0.035	0.015	9.688
120	18	0.064	0.058	2.141	0.017	0.023	0.029	0.024	0.015	8.609
123		0.073	0.050	2.188	0.017	0.024	0.022	0.032	0.015	9.131
127	19	0.058	0.054	2.304	0.017	0.012	0.030	0.024	0.015	9.202
130		0.070	0.051	2.199	0.017	0.014	0.022	0.024	0.015	8.876
134	20	0.066	0.056	2.035	0.017	0.016	0.025	0.022	0.016	8.866
137		0.060	0.056	2.311	0.017	0.014	0.028	0.019	0.014	9.893
141	21	0.065	0.058	2.030	0.017	0.033	0.029	0.029	0.016	8.553
144		0.069	0.067	2.040	0.017	0.024	0.039	0.013	0.015	8.314
Initial conc.		1.600	439.100	4,137.100	85.500	2.200	14.100	150.100	21.100	4,043.100

TKW-6

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.027	0.094	16.722	0.000	0.148	0.000	0.000	0.000	5.570
4		0.166	0.145	11.755	0.007	0.153	0.000	0.091	0.020	2.910
8	2	0.093	0.055	4.548	0.001	0.100	0.000	0.000	0.004	2.930
11		0.036	0.093	8.295	0.005	0.035	0.000	0.052	0.000	0.000
15	3	0.072	0.061	9.428	0.000	0.087	0.000	0.106	0.013	10.130
18		0.096	0.041	8.568	0.000	0.120	0.000	0.000	0.000	6.400
22	4	0.081	0.060	7.879	0.000	0.000	0.000	0.030	0.000	8.100
25		0.026	0.047	1.333	0.000	0.041	0.000	0.000	0.000	6.040
29	5	0.100	0.052	6.989	0.000	0.102	0.000	0.000	0.000	4.770
32		0.219	0.081	6.811	0.000	0.086	0.000	0.077	0.000	8.240
36	6	0.025	0.000	5.509	0.000	0.000	0.017	0.140	0.223	8.681
39		0.035	0.000	5.143	0.000	0.000	0.000	0.111	0.225	7.918
43	7	0.027	0.000	5.229	0.000	0.000	0.000	0.169	0.214	7.556
46		0.036	0.000	5.173	0.000	0.000	0.000	0.181	0.231	7.764
50	8	0.026	0.000	5.068	0.000	0.000	0.000	0.145	0.226	7.306
53		0.025	0.000	5.358	0.000	0.000	0.000	0.224	0.234	8.038
57	9	0.031	0.000	5.272	0.000	0.000	0.000	0.148	0.215	8.006
60		0.037	0.011	5.303	0.000	0.000	0.000	0.078	0.223	7.914
64	10	0.028	0.000	5.251	0.000	0.000	0.000	0.071	0.226	7.662
67		0.050	0.000	5.192	0.000	0.000	0.000	0.206	0.218	7.758
71	11	0.030	0.000	4.744	0.000	0.000	0.000	0.172	0.229	6.960
74		0.030	0.000	4.554	0.000	0.000	0.000	0.112	0.229	7.126
78	12	0.033	0.000	4.487	0.000	0.000	0.000	0.151	0.218	7.239
81		0.038	0.000	4.406	0.000	0.000	0.000	0.078	0.231	6.927
85	13	0.037	0.000	4.209	0.000	0.000	0.000	0.154	0.229	6.819
88		0.031	0.000	4.341	0.000	0.000	0.000	0.228	0.225	6.937
92	14	0.030	0.000	3.922	0.000	0.000	0.000	0.175	0.226	6.216
95		0.037	0.000	4.171	0.000	0.000	0.000	0.174	0.228	6.932
99	15	0.031	0.000	3.685	0.000	0.000	0.000	0.176	0.232	6.029
102		0.040	0.000	3.868	0.000	0.000	0.000	0.221	0.223	6.243
106	16	0.032	0.000	4.098	0.000	0.000	0.000	0.123	0.217	6.625
109		0.030	0.000	3.992	0.000	0.000	0.000	0.216	0.220	6.420
113	17	0.021	0.000	4.110	0.000	0.000	0.000	0.086	0.218	6.433
116		0.059	0.000	4.579	0.000	0.000	0.000	0.120	0.081	14.478
120	18	0.031	0.000	3.049	0.000	0.000	0.000	0.115	0.081	9.600
123		0.028	0.000	4.061	0.000	0.000	0.000	0.119	0.081	11.290
127	19	0.033	0.000	0.031	0.000	0.000	0.000	0.116	0.080	6.796
130		0.027	0.000	3.977	0.000	0.000	0.000	0.120	0.080	5.997
134	20	0.031	0.004	4.017	0.000	0.000	0.000	0.113	0.081	5.500
137		0.029	0.000	4.348	0.000	0.000	0.000	0.115	0.081	5.171
141	21	0.024	0.000	0.000	0.000	0.000	0.000	0.122	0.081	4.601
144		0.023	0.000	4.399	0.000	0.000	0.000	0.112	0.081	3.715
Initial conc.		0.500	285.000	1,108.300	38.800	1.900	0.000	61.700	78.200	53,600.000

TKW-8

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.155	0.333	0.053	0.000	0.024	0.110	0.119	0.080	10.434
4		0.138	6.200	4.497	0.058	0.039	0.221	0.116	0.090	14.094
8	2	0.150	3.094	0.314	0.017	0.024	0.129	0.118	0.085	16.467
11		0.141	0.978	0.031	0.020	0.035	0.064	0.114	0.082	16.089
15	3	0.145	0.572	0.049	0.019	0.032	0.062	0.109	0.080	20.908
18		0.135	0.833	0.052	0.000	0.034	0.036	0.110	0.079	16.275
22	4	0.155	0.155	0.041	0.000	0.026	0.041	0.116	0.079	20.863
25		0.148	0.071	0.013	0.000	0.037	0.059	0.118	0.079	19.715
29	5	0.146	0.684	4.246	0.000	0.023	0.040	0.113	0.078	14.671
32		0.153	1.408	4.799	0.005	0.034	0.040	0.112	0.079	20.872
36	6	0.147	2.030	4.755	0.011	0.023	0.046	0.089	0.088	20.241
39		0.157	1.206	3.955	0.003	0.029	0.036	0.066	0.096	19.609
43	7	0.150	0.992	3.955	0.001	0.024	0.028	0.067	0.096	20.744
46		0.154	1.346	3.407	0.004	0.021	0.033	0.067	0.094	17.406
50	8	0.163	1.598	3.969	0.006	0.018	0.042	0.060	0.096	20.906
53		0.162	1.524	3.656	0.006	0.030	0.037	0.062	0.098	22.208
57	9	0.159	1.715	4.222	0.008	0.035	0.036	0.070	0.099	23.510
60		0.151	2.204	4.235	0.013	0.029	0.047	0.069	0.099	22.257
64	10	0.174	1.043	4.288	0.002	0.040	0.051	0.073	0.097	24.154
67		0.167	1.307	4.155	0.004	0.016	0.044	0.085	0.098	22.488
71	11	0.175	1.386	3.897	0.008	0.015	0.057	0.076	0.098	21.971
74		0.165	1.577	3.919	0.007	0.024	0.056	0.079	0.096	21.369
78	12	0.157	1.403	4.336	0.005	0.023	0.051	0.081	0.098	23.899
81		0.159	1.462	3.752	0.006	0.018	0.050	0.067	0.097	21.132
85	13	0.153	1.229	3.590	0.030	0.025	0.046	0.063	0.101	21.365
88		0.168	1.676	3.391	0.008	0.007	0.047	0.075	0.101	20.934
92	14	0.179	2.006	3.400	0.011	0.028	0.095	0.063	0.099	20.947
95		0.171	1.582	3.110	0.006	0.035	0.070	0.071	0.102	20.960
99	15	0.167	1.799	3.481	0.008	0.020	0.055	0.066	0.094	23.257
102		0.174	1.832	3.253	0.013	0.020	0.061	0.068	0.100	22.218
106	16	0.160	1.840	3.278	0.008	0.025	0.069	0.072	0.097	22.369
109		0.160	1.284	2.903	0.003	0.027	0.055	0.072	0.096	22.519
113	17	0.162	0.846	2.530	0.000	0.014	0.047	0.122	0.082	22.118
116		0.079	1.126	2.590	0.000	0.008	0.109	0.122	0.083	23.232
120	18	0.047	1.108	2.835	0.000	0.018	0.011	0.067	0.097	24.345
123		0.033	0.366	0.936	0.000	0.014	0.014	0.062	0.093	23.944
127	19	0.038	0.365	0.872	0.000	0.012	0.010	0.062	0.097	23.101
130		0.043	0.363	0.808	0.000	0.010	0.005	0.066	0.096	25.800
134	20	0.033	0.312	0.764	0.000	0.008	0.002	0.063	0.097	25.859
137		0.040	0.274	0.684	0.000	0.006	0.003	0.068	0.098	25.301
141	21	0.022	0.326	0.671	0.000	0.004	0.004	0.071	0.098	23.777
144		0.039	0.294	0.511	0.000	0.001	0.001	0.065	0.098	22.740
Initial conc.		15.600	39,441.400	9,143.800	229.000	4.000	49.800	79.500	29.200	19,993.500

TKW-11

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.165	0.392	0.437	0.277	0.448	0.050	0.013	0.002	4.260
4		0.171	0.373	0.434	0.285	0.543	0.044	0.088	0.009	1.594
8	2	0.054	0.437	0.447	0.285	0.549	0.049	0.008	0.015	1.034
11		0.125	0.487	0.454	0.285	0.460	0.050	0.009	0.033	0.027
15	3	0.117	0.332	0.426	0.273	0.371	0.039	0.000	0.003	0.350
18		0.156	0.390	0.440	0.281	0.449	0.043	0.000	0.009	0.247
22	4	0.194	0.447	0.454	0.288	0.526	0.046	0.000	0.014	0.144
25		0.131	0.382	0.457	0.286	0.454	0.048	0.000	0.007	0.053
29	5	0.089	0.448	0.450	0.296	0.423	0.044	0.000	0.000	0.194
32		0.130	0.428	0.439	0.287	0.496	0.033	0.000	0.000	0.101
36	6	0.017	1.508	11.542	0.029	0.045	0.129	0.000	0.008	0.362
39		0.026	4.316	15.546	0.091	0.058	0.190	0.010	0.000	0.396
43	7	0.011	3.200	14.137	0.077	0.046	0.139	0.000	0.005	0.374
46		0.044	3.892	11.504	0.080	0.046	0.128	0.000	0.010	0.271
50	8	0.002	6.456	15.977	0.138	0.058	0.177	0.004	0.004	0.366
53		0.018	8.807	17.249	0.191	0.054	0.203	0.002	0.004	0.356
57	9	0.034	11.157	18.520	0.243	0.049	0.228	0.000	0.004	0.345
60		0.000	11.448	20.069	0.253	0.060	0.335	0.011	0.019	0.368
64	10	0.006	8.474	16.675	0.183	0.045	0.272	0.013	0.002	0.325
67		0.008	4.170	15.543	0.086	0.059	0.237	0.007	0.006	0.387
71	11	0.026	6.519	16.347	0.143	0.048	0.293	0.002	0.011	0.367
74		0.000	5.958	14.822	0.128	0.044	0.283	0.007	0.012	0.340
78	12	0.183	5.627	15.435	0.118	0.035	0.221	0.010	0.018	0.381
81		0.032	6.093	15.116	0.137	0.055	0.286	0.012	0.001	0.360
85	13	0.000	4.153	14.423	0.088	0.056	0.220	0.004	0.004	0.417
88		0.047	2.691	3.590	0.033	0.004	0.119	0.011	0.004	0.068
92	14	0.016	6.106	13.491	0.133	0.041	0.311	0.000	0.017	0.346
95		0.015	5.590	12.645	0.157	0.041	0.305	0.253	0.229	13.839
99	15	0.014	5.799	12.504	0.126	0.039	0.293	0.091	0.222	11.611
102		0.036	5.186	11.572	0.109	0.039	0.298	0.114	0.222	11.293
106	16	0.041	3.746	10.310	0.083	0.027	0.259	0.198	0.228	11.625
109		0.039	1.247	2.563	0.009	0.005	0.097	0.005	0.004	13.192
113	17	0.000	3.072	10.048	0.062	0.038	0.241	0.246	0.237	12.289
116		0.015	2.702	9.271	0.054	0.037	0.234	0.160	0.229	11.903
120	18	0.016	4.824	10.442	0.101	0.020	0.277	0.135	0.226	11.481
123		0.000	10.927	16.534	0.264	0.049	0.419	0.087	0.219	13.903
127	19	0.041	6.732	12.955	0.153	0.043	0.344	0.204	0.229	13.244
130		0.088	2.059	3.023	0.000	0.000	0.006	0.176	0.227	12.525
134	20	0.047	3.551	3.953	0.018	0.000	0.026	0.278	0.222	13.996
137		0.036	3.929	4.173	0.039	0.000	0.048	0.185	0.227	13.781
141	21	0.036	3.578	3.779	0.019	0.000	0.031	0.228	0.234	12.914
144		0.031	6.759	5.877	0.078	0.000	0.079	0.238	0.237	15.745
Initial conc.		10.700	696.400	209.000	28.800	54.800	4.500	392.700	264.200	402.300

TKW-14

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.128	1.458	3.085	0.060	0.219	0.038	0.081	0.099	10.829
4		0.104	0.681	2.510	0.051	0.224	0.210	0.066	0.097	10.067
8	2	0.098	2.428	5.604	0.061	0.225	0.279	0.073	0.108	18.390
11		0.115	0.948	3.875	0.054	0.211	0.224	0.070	0.095	14.396
15	3	0.111	0.116	3.934	0.047	0.222	0.138	0.068	0.096	16.260
18		0.113	0.146	3.992	0.050	0.230	0.197	0.065	0.096	18.124
22	4	0.094	1.054	4.581	0.055	0.218	0.217	0.074	0.099	20.906
25		0.113	1.562	4.647	0.062	0.214	0.218	0.059	0.101	19.317
29	5	0.086	0.825	3.845	0.053	0.230	0.277	0.073	0.095	18.033
32		0.114	0.996	3.827	0.055	0.224	0.192	0.063	0.100	17.872
36	6	0.103	1.375	4.203	0.056	0.204	0.200	0.069	0.097	19.068
39		0.106	1.072	3.897	0.054	0.236	0.197	0.060	0.098	19.452
43	7	0.098	0.940	3.910	0.055	0.235	0.194	0.074	0.097	19.057
46		0.104	1.188	3.528	0.055	0.201	0.197	0.064	0.098	18.661
50	8	0.104	1.278	4.103	0.053	0.236	0.221	0.071	0.094	23.576
53		0.102	0.940	3.496	0.053	0.230	0.206	0.069	0.096	20.938
57	9	0.102	0.882	3.958	0.054	0.225	0.190	0.064	0.096	25.637
60		0.088	1.205	3.454	0.056	0.225	0.220	0.079	0.096	22.236
64	10	0.099	0.623	3.269	0.052	0.211	0.187	0.070	0.095	24.122
67		0.091	0.679	3.033	0.052	0.221	0.191	0.080	0.099	22.037
71	11	0.120	0.899	3.652	0.054	0.226	0.221	0.062	0.097	17.709
74		0.073	1.479	3.105	0.056	0.229	0.206	0.072	0.102	13.380
78	12	0.144	1.166	3.245	0.054	0.222	0.227	0.084	0.102	22.235
81		0.103	1.044	1.905	0.125	0.224	0.202	0.079	0.097	19.005
85	13	0.108	1.968	2.773	0.056	0.214	0.213	0.077	0.095	18.807
88		0.117	0.950	2.592	0.054	0.223	0.211	0.077	0.097	18.895
92	14	0.098	1.194	2.574	0.057	0.231	0.222	0.069	0.101	22.099
95		0.109	1.279	2.586	0.071	0.223	0.212	0.064	0.102	19.714
99	15	0.102	1.385	2.556	0.061	0.210	0.207	0.080	0.097	21.399
102		0.096	0.839	2.536	0.053	0.208	0.213	0.069	0.099	19.441
106	16	0.098	0.815	2.229	0.052	0.208	0.206	0.080	0.099	19.951
109		0.124	0.508	1.365	0.021	0.014	0.076	0.042	0.054	18.568
113	17	0.121	0.330	1.397	0.020	0.042	0.053	0.004	0.008	17.184
116		0.144	1.087	1.672	0.031	0.028	0.107	0.002	0.006	19.514
120	18	0.089	0.703	2.146	0.051	0.217	0.214	0.075	0.100	22.701
123		0.120	0.941	1.667	0.024	0.055	0.077	0.118	0.084	21.165
127	19	0.098	0.869	2.054	0.054	0.214	0.187	0.070	0.095	21.643
130		0.117	0.688	1.747	0.052	0.214	0.186	0.058	0.099	20.285
134	20	0.089	0.935	1.955	0.053	0.202	0.192	0.096	0.098	21.482
137		0.115	0.753	1.752	0.052	0.232	0.191	0.072	0.100	20.712
141	21	0.084	0.751	1.773	0.051	0.211	0.213	0.070	0.094	21.438
144		0.088	0.758	1.887	0.054	0.218	0.439	0.081	0.103	20.263
Initial conc.		4.200	32,418.000	13,799.400	460.100	2.200	12.600	20.200	19.500	5,759.000

TKW-15

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.233	0.285	26.206	0.038	0.077	0.147	0.065	0.153	0.065
4		0.154	0.415	7.731	0.034	0.063	0.127	0.062	0.098	26.847
8	2	0.138	0.220	8.712	0.031	0.060	0.128	0.061	0.096	22.675
11		0.144	0.702	6.366	0.032	0.054	0.155	0.067	0.097	15.911
15	3	0.143	0.435	7.241	0.031	0.060	0.122	0.055	0.092	18.160
18		0.135	0.171	4.529	0.030	0.059	0.095	0.060	0.095	12.733
22	4	0.138	0.755	8.101	0.033	0.053	0.148	0.058	0.095	15.810
25		0.124	0.926	7.337	0.035	0.075	0.126	0.059	0.095	10.564
29	5	0.195	0.410	4.325	0.032	0.070	0.089	0.066	0.065	12.268
32		0.127	0.258	3.477	0.032	0.059	0.087	0.055	0.096	8.388
36	6	0.124	0.919	4.115	0.033	0.061	0.124	0.064	0.096	9.568
39		0.113	0.829	3.232	0.032	0.057	0.103	0.057	0.095	8.491
43	7	0.121	0.578	3.452	0.031	0.055	0.079	0.058	0.096	6.771
46		0.116	0.631	2.392	0.031	0.049	0.115	0.056	0.092	8.194
50	8	0.120	0.723	3.657	0.033	0.055	0.098	0.057	0.095	0.000
53		0.111	0.692	2.688	0.032	0.042	0.094	0.059	0.094	5.709
57	9	0.132	0.515	3.513	0.033	0.054	0.093	0.054	0.099	5.183
60		0.104	0.873	2.785	0.033	0.058	0.110	0.056	0.094	7.433
64	10	0.115	0.476	3.210	0.032	0.048	0.103	0.064	0.095	6.130
67		0.118	0.883	2.548	0.033	0.052	0.109	0.055	0.100	4.637
71	11	0.111	0.521	2.380	0.032	0.052	0.113	0.062	0.094	4.339
74		0.115	0.627	1.838	0.031	0.045	0.108	0.059	0.093	3.055
78	12	0.122	0.604	0.211	0.033	0.053	0.105	0.059	0.092	0.000
81		0.122	0.802	1.671	0.032	0.071	0.118	0.053	0.097	2.490
85	13	0.122	0.884	1.658	0.032	0.055	0.109	0.055	0.095	2.274
88		0.118	1.899	1.953	0.035	0.054	0.146	0.062	0.103	2.220
92	14	0.113	0.991	1.755	0.032	0.053	0.121	0.049	0.095	2.368
95		0.104	1.006	1.591	0.033	0.052	0.125	0.049	0.097	1.719
99	15	0.120	0.822	2.059	0.033	0.055	0.125	0.050	0.097	2.058
102		0.129	1.082	1.666	0.033	0.050	0.175	0.062	0.094	1.517
106	16	0.119	0.967	1.652	0.032	0.051	0.128	0.080	0.097	31.657
109		0.116	0.994	1.424	0.033	0.050	0.127	0.077	0.096	27.867
113	17	0.146	0.913	1.688	0.024	0.015	0.082	0.085	0.097	36.210
116		0.084	0.673	1.291	0.022	0.012	0.066	0.089	0.102	26.341
120	18	0.110	1.072	1.772	0.033	0.049	0.115	0.082	0.102	34.294
123		0.125	1.535	1.516	0.034	0.051	0.105	0.086	0.104	37.981
127	19	0.125	1.380	1.701	0.035	0.049	0.117	0.090	0.103	43.799
130		0.118	1.464	1.551	0.034	0.062	0.101	0.111	0.104	31.075
134	20	0.122	1.959	2.312	0.037	0.061	0.127	0.083	0.101	37.185
137		0.117	1.905	1.632	0.038	0.057	0.124	0.089	0.103	30.540
141	21	0.125	1.175	1.604	0.034	0.046	0.132	0.086	0.102	37.162
144		0.111	1.632	1.647	0.035	0.058	0.125	0.088	0.103	29.206
Initial conc.		4.900	35,879.800	7,460.300	61.700	2.200	8.400	324.700	36.600	1,589.500

TKW-18

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.249	1.350	4.604	0.040	0.066	0.374	0.073	0.100	40.525
4		0.121	0.309	3.556	0.037	0.064	0.102	0.083	0.091	23.705
8	2	0.123	0.178	2.729	0.028	0.054	0.106	0.064	0.092	17.925
11		0.117	0.194	3.755	0.028	0.052	0.101	0.063	0.099	20.416
15	3	0.111	0.177	3.788	0.028	0.054	0.094	0.064	0.094	20.384
18		0.112	0.184	3.765	0.028	0.054	0.128	0.060	0.095	19.915
22	4	0.110	0.172	3.842	0.028	0.043	0.108	0.063	0.095	20.581
25		0.114	0.172	3.648	0.028	0.089	0.127	0.063	0.092	19.998
29	5	0.111	0.195	3.230	0.028	0.052	0.094	0.061	0.092	18.804
32		0.123	0.174	3.490	0.028	0.062	0.080	0.065	0.092	18.939
36	6	0.141	0.143	3.022	0.048	0.245	0.167	0.071	0.092	19.074
39		0.177	0.140	2.979	0.047	0.221	0.180	0.063	0.096	19.792
43	7	0.110	0.129	2.801	0.046	0.234	0.160	0.069	0.096	19.478
46		0.110	0.454	2.817	0.052	0.219	0.166	0.068	0.095	18.904
50	8	0.127	0.176	2.546	0.047	0.224	0.168	0.074	0.091	18.929
53		0.123	0.125	2.612	0.047	0.225	0.161	0.067	0.092	19.482
57	9	0.114	0.132	2.354	0.047	0.215	0.164	0.072	0.093	17.786
60		0.082	0.131	2.309	0.047	0.223	0.167	0.062	0.092	16.387
64	10	0.121	0.131	4.324	0.047	0.211	0.181	0.072	0.090	19.469
67		0.092	0.130	4.821	0.048	0.221	0.208	0.061	0.091	18.930
71	11	0.122	0.141	3.794	0.049	0.231	0.188	0.065	0.096	18.539
74		0.104	0.134	3.854	0.048	0.219	0.184	0.055	0.092	19.270
78	12	0.107	0.136	4.041	0.048	0.228	0.184	0.062	0.093	18.927
81		0.110	0.147	3.508	0.048	0.219	0.186	0.090	0.093	18.584
85	13	0.087	0.129	3.772	0.047	0.228	0.179	0.060	0.096	20.579
88		0.101	0.141	3.409	0.052	0.223	0.189	0.064	0.092	16.554
92	14	0.111	0.140	2.909	0.048	0.238	0.192	0.075	0.091	12.998
95		0.114	0.136	3.422	0.048	0.196	0.174	0.063	0.093	19.012
99	15	0.101	0.133	3.298	0.048	0.226	0.185	0.061	0.091	18.998
102		0.111	0.158	3.223	0.049	0.217	0.213	0.064	0.097	18.630
106	16	0.120	0.129	3.268	0.047	0.239	0.189	0.066	0.093	19.061
109		0.125	0.137	3.048	0.047	0.216	0.191	0.062	0.095	19.058
113	17	0.121	0.097	2.091	0.017	0.045	0.100	0.118	0.081	20.028
116		0.094	0.088	2.038	0.020	0.037	0.047	0.000	0.000	19.602
120	18	0.095	0.135	2.948	0.048	0.246	0.197	0.063	0.094	19.567
123		0.093	0.129	2.914	0.048	0.225	0.175	0.070	0.094	19.572
127	19	0.108	0.134	2.931	0.047	0.232	0.193	0.061	0.092	19.969
130		0.121	0.136	2.580	0.048	0.213	0.192	0.061	0.095	19.147
134	20	0.126	0.132	3.055	0.047	0.204	0.201	0.065	0.092	20.302
137		0.111	0.127	3.281	0.047	0.215	0.189	0.063	0.095	18.922
141	21	0.115	0.137	3.063	0.047	0.225	0.180	0.067	0.095	20.723
144		0.104	0.132	2.790	0.049	0.227	0.170	0.063	0.093	20.990
Initial conc.		5.600	7,001.600	8,807.400	248.900	3.400	28.900	14.900	9.300	27,108.700

TKW-19

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.160	7.575	51.401	0.223	0.244	1.112	0.346	0.081	4.349
4		0.297	4.139	23.151	0.175	0.221	1.459	0.000	0.025	33.836
8	2	0.304	10.944	48.451	0.207	0.201	0.897	0.000	0.062	17.354
11		0.396	10.460	38.344	0.108	0.084	0.747	0.000	0.040	24.946
15	3	0.420	9.234	47.850	0.069	0.134	0.321	0.000	0.025	27.912
18		0.312	8.007	43.969	0.149	0.218	1.273	0.000	0.025	30.877
22	4	0.254	5.058	48.059	0.115	0.170	0.568	0.233	0.023	30.252
25		0.316	12.371	46.577	0.202	0.146	1.878	0.000	0.047	29.305
29	5	0.447	3.740	43.374	0.102	0.140	0.654	0.000	0.039	29.623
32		0.472	5.079	39.993	0.099	0.228	0.364	0.000	0.032	29.941
36	6	0.295	3.939	45.204	0.103	0.118	0.494	0.000	0.027	28.716
39		0.597	3.100	37.987	0.084	0.093	0.430	0.000	0.040	27.490
43	7	0.476	2.689	40.499	0.085	0.000	0.295	0.000	0.026	30.756
46		0.642	3.608	34.971	0.089	0.490	0.348	0.000	0.000	26.124
50	8	0.515	2.726	36.366	0.085	0.189	0.403	0.126	0.060	28.899
53		0.577	5.393	34.572	0.117	0.186	0.637	0.073	0.064	26.238
57	9	0.387	5.204	38.976	0.112	0.080	0.529	0.088	0.061	29.573
60		0.470	3.450	34.959	0.092	0.144	0.541	0.133	0.043	26.579
64	10	0.398	3.009	37.103	0.087	0.203	0.493	0.051	0.050	31.128
67		0.748	2.181	34.075	0.075	0.173	0.485	0.101	0.055	27.382
71	11	0.548	4.489	36.470	0.103	0.155	0.705	0.110	0.044	30.662
74		0.720	3.427	30.696	0.085	0.129	0.628	0.026	0.053	29.699
78	12	0.496	3.179	33.533	0.087	0.229	0.470	0.105	0.053	32.137
81		0.488	2.777	33.320	0.083	0.179	0.454	0.071	0.045	26.719
85	13	0.693	2.118	35.313	0.083	0.170	0.339	0.063	0.067	21.300
88		0.552	7.214	30.023	0.143	0.206	0.829	0.029	0.061	35.515
92	14	0.530	4.324	26.736	0.100	0.165	0.642	0.000	0.062	27.873
95		0.542	3.207	26.157	0.030	0.164	0.555	0.120	0.056	25.930
99	15	0.298	3.753	28.718	0.106	0.253	0.585	0.026	0.056	26.314
102		0.346	2.780	25.117	0.083	0.122	0.567	0.092	0.055	26.902
106	16	0.392	4.071	27.700	0.101	0.161	0.561	0.049	0.043	38.667
109		0.271	4.599	25.736	0.144	0.223	0.664	0.074	0.073	39.352
113	17	0.327	4.179	26.303	0.120	0.189	0.563	0.055	0.062	44.892
116		0.383	3.759	26.871	0.097	0.155	0.462	0.037	0.052	50.432
120	18	0.423	3.210	26.041	0.094	0.203	0.474	0.043	0.056	40.037
123		0.373	3.446	26.041	0.092	0.149	0.363	0.024	0.060	29.641
127	19	0.384	3.404	24.808	0.092	0.178	0.374	0.040	0.053	28.229
130		0.395	3.361	23.574	0.092	0.206	0.384	0.055	0.046	41.037
134	20	0.380	2.276	25.689	0.102	0.200	0.384	0.030	0.047	30.106
137		0.453	3.330	24.118	0.097	0.208	0.367	0.000	0.044	28.972
141	21	0.376	3.053	23.393	0.093	0.151	0.449	0.042	0.052	25.120
144		0.289	3.312	23.756	0.086	0.114	0.506	0.021	0.048	27.046
Initial conc.		7.100	33,803.900	8,456.000	330.700	1.800	9.400	6.100	2.300	3,781.200

TKW-22

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.055	0.893	1.313	1.120	0.022	0.317	0.143	0.084	0.975
4		0.099	1.223	7.967	2.131	0.106	0.550	0.006	0.025	8.485
8	2	0.158	0.429	11.294	2.474	0.003	0.625	0.003	0.008	7.350
11		0.043	0.061	14.621	1.346	0.008	0.059	0.000	0.006	3.438
15	3	0.000	0.342	34.264	0.934	0.000	0.048	0.003	0.009	1.551
18		0.000	0.126	21.908	0.683	0.000	0.018	0.008	0.010	0.289
22	4	0.000	0.875	10.795	0.310	0.000	0.069	0.010	0.013	0.206
25		0.000	0.013	3.142	0.000	0.000	0.000	0.000	0.000	0.079
29	5	0.000	0.029	1.492	0.000	0.000	0.000	0.000	0.000	0.049
32		0.000	0.082	1.001	0.000	0.013	0.040	0.000	0.002	0.036
36	6	0.000	1.749	0.000	0.000	0.000	0.000	0.000	0.004	0.023
39		0.000	0.327	0.743	0.000	0.000	0.000	0.001	0.009	0.034
43	7	0.000	1.543	1.028	0.000	0.000	0.000	0.011	0.006	0.035
46		0.000	38.367	2.054	0.238	0.000	0.000	0.015	0.008	0.036
50	8	0.000	11.784	1.516	0.044	0.000	0.000	0.000	0.010	0.024
53		0.000	8.648	1.104	0.005	0.000	0.000	0.000	0.006	0.034
57	9	0.000	18.443	1.684	0.121	0.000	0.055	0.014	0.000	0.205
60		0.000	24.819	1.886	0.187	0.000	0.170	0.006	0.000	0.031
64	10	0.000	20.722	1.709	0.155	0.000	0.129	0.000	0.006	0.032
67		0.000	10.114	1.365	0.027	0.000	0.019	0.000	0.006	0.045
71	11	0.000	19.320	2.004	0.113	0.000	0.129	0.000	0.013	0.028
74		0.000	15.627	1.459	0.084	0.000	0.100	0.011	0.007	0.033
78	12	0.000	10.483	1.367	0.002	0.000	0.040	0.000	0.000	0.017
81		0.000	11.668	1.164	0.025	0.000	0.034	0.007	0.007	0.028
85	13	0.000	9.202	1.236	0.000	0.000	0.031	0.002	0.014	0.030
88		0.000	4.286	0.997	0.000	0.000	0.000	0.000	0.011	0.032
92	14	0.000	4.216	1.119	0.000	0.000	0.025	0.016	0.010	0.126
95		0.000	0.222	0.662	0.000	0.000	0.000	0.008	0.003	0.263
99	15	0.000	2.786	1.365	0.000	0.000	0.058	0.010	0.000	0.655
102		0.000	4.153	0.963	0.000	0.000	0.000	0.003	0.000	1.009
106	16	0.000	2.982	1.032	0.000	0.000	0.000	0.000	0.007	0.803
109		0.041	0.826	0.217	0.055	0.003	0.051	0.000	0.020	0.984
113	17	0.000	3.396	0.981	0.000	0.000	0.000	0.016	0.003	0.756
116		0.000	2.430	1.046	0.000	0.000	0.002	0.021	0.000	0.758
120	18	0.000	3.038	0.975	0.000	0.000	0.000	0.004	0.004	0.833
123		0.000	5.674	1.139	0.000	0.000	0.021	0.000	0.000	0.611
127	19	0.000	5.111	0.841	0.000	0.000	0.000	0.022	0.007	0.644
130		0.000	7.014	0.949	0.000	0.000	0.000	0.017	0.000	0.971
134	20	0.000	14.700	1.744	0.105	0.000	0.084	0.012	0.017	0.516
137		0.000	3.313	0.708	0.000	0.000	0.000	0.001	0.000	0.417
141	21	0.000	2.995	0.533	0.000	0.000	0.000	0.023	0.000	0.427
144		0.000	2.831	0.541	0.000	0.000	0.000	0.012	0.047	0.427
Initial conc.		2.900	26.100	198.600	6.400	1.600	6.600	188.400	12.500	6,511.000

TKW-23

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.045	0.015	0.083	0.000	0.758	6.721	172.753	0.621	45.260
4		0.108	5.643	43.457	35.638	0.287	3.629	175.857	10.948	49.169
8	2	0.204	10.459	12.230	10.237	0.174	3.357	169.649	4.081	51.123
11		0.058	6.386	1.712	1.221	0.029	2.015	150.998	1.050	53.077
15	3	0.044	8.729	1.727	0.791	0.137	2.138	172.258	0.693	13.349
18		0.000	6.457	0.979	0.969	0.132	1.596	193.518	0.653	6.675
22	4	0.168	5.141	0.941	0.321	0.075	1.235	60.581	0.351	3.652
25		0.012	5.365	0.761	0.258	0.105	1.252	60.849	0.303	3.040
29	5	0.051	4.517	0.901	0.276	0.124	1.098	76.740	0.412	4.278
32		0.112	4.602	0.617	0.215	0.149	0.928	41.761	0.263	2.516
36	6	0.203	14.938	1.384	0.461	0.000	2.142	38.125	0.164	1.333
39		0.224	12.347	0.277	0.285	0.000	1.702	28.689	0.100	1.847
43	7	0.256	12.496	1.168	0.348	0.000	1.850	25.946	0.119	2.173
46		0.230	9.649	0.623	0.192	0.000	1.333	22.053	0.074	1.321
50	8	0.267	11.536	0.984	0.289	0.000	1.684	22.215	0.099	1.866
53		0.223	10.736	0.742	0.209	0.000	1.484	20.177	0.075	1.499
57	9	0.222	10.281	1.089	0.271	0.000	2.047	18.297	0.089	1.970
60		0.243	10.297	0.753	0.222	0.000	1.564	17.727	0.078	1.505
64	10	0.228	9.077	1.035	0.247	0.000	1.970	15.164	0.083	0.808
67		0.235	8.414	0.554	0.150	0.000	1.165	13.974	0.081	0.910
71	11	0.331	8.894	1.090	0.255	0.000	2.257	7.921	0.070	0.643
74		0.278	8.236	0.745	0.188	0.000	1.771	7.241	0.074	0.663
78	12	0.267	8.203	0.964	0.220	0.000	2.034	6.029	0.050	0.408
81		0.125	4.138	0.297	0.078	0.000	0.785	4.064	0.045	0.400
85	13	0.136	3.022	0.009	0.073	0.041	0.742	5.027	0.039	0.473
88		0.179	4.740	0.554	0.089	0.000	0.870	3.186	0.048	0.280
92	14	0.144	4.536	0.232	0.067	0.034	0.631	3.876	0.039	0.213
95		0.152	4.424	0.362	0.093	0.026	0.911	3.304	0.045	0.245
99	15	0.162	4.464	0.384	0.098	0.028	0.983	2.731	0.050	0.276
102		0.171	4.351	0.302	0.081	0.000	0.835	3.119	0.044	0.146
106	16	0.160	4.473	0.313	0.082	0.114	0.859	2.008	0.044	0.147
109		0.163	3.897	0.240	0.067	0.121	0.777	1.621	0.037	0.129
113	17	0.219	3.996	0.310	0.086	0.064	0.849	1.506	0.044	0.118
116		0.155	3.912	0.232	0.070	0.048	0.784	1.310	0.039	0.095
120	18	0.209	3.828	0.321	0.080	0.123	0.837	1.124	0.041	0.066
123		0.183	3.477	0.206	0.061	0.128	0.673	1.029	0.035	0.049
127	19	0.183	3.628	0.314	0.074	0.131	0.789	0.888	0.039	0.050
130		0.203	3.335	0.228	0.062	0.107	0.665	0.759	0.035	0.036
134	20	0.223	3.221	0.358	0.081	0.129	0.861	0.654	0.039	0.023
137		0.230	3.286	0.243	0.065	0.108	0.734	0.571	0.037	0.044
141	21	0.243	2.969	0.364	0.074	0.106	1.021	0.372	0.037	0.000
144		0.225	2.863	0.304	0.071	0.132	0.957	0.205	0.036	0.000
Initial conc.		0.000	462,280.000	8,230.000	3,440.000	621.700	106.900	84,218.200	430.100	443.600

TKW-25

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.004	9.302	7.534	0.123	0.000	0.368	0.000	0.019	9.813
4		0.022	1.184	4.000	0.000	0.000	0.058	0.000	0.008	10.816
8	2	0.023	1.788	3.634	0.000	0.000	0.051	0.000	0.009	9.957
11		0.021	0.000	3.315	0.000	0.000	0.000	0.008	0.007	10.813
15	3	0.014	0.012	3.464	0.000	0.000	0.000	0.000	0.006	11.230
18		0.011	1.070	3.292	0.000	0.000	0.000	0.000	0.006	10.520
22	4	0.022	0.707	3.614	0.000	0.000	0.000	0.000	0.007	11.345
25		0.023	1.053	3.464	0.000	0.000	0.000	0.000	0.007	12.070
29	5	0.025	0.676	3.150	0.000	0.000	0.000	0.000	0.008	11.862
32		0.023	0.859	3.937	0.000	0.000	0.000	0.000	0.007	11.644
36	6	0.025	1.505	4.227	0.000	0.000	0.000	0.000	0.008	12.785
39		0.029	2.134	4.000	0.000	0.000	0.000	0.001	0.009	13.683
43	7	0.028	0.899	4.008	0.000	0.000	0.000	0.000	0.011	13.694
46		0.032	1.389	3.803	0.000	0.000	0.000	0.012	0.009	15.198
50	8	0.024	2.398	3.987	0.000	0.000	0.000	0.000	0.009	12.814
53		0.022	2.350	4.567	0.000	0.000	0.000	0.000	0.010	13.467
57	9	0.030	0.500	3.391	0.000	0.000	0.000	0.000	0.011	14.793
60		0.086	2.008	3.918	0.000	0.000	0.000	0.000	0.010	13.127
64	10	0.031	1.804	3.949	0.000	0.000	0.000	0.000	0.010	13.628
67		0.116	2.090	4.008	0.025	0.005	0.040	0.000	0.010	13.311
71	11	0.074	2.361	4.365	0.030	0.001	0.021	0.000	0.010	14.955
74		0.066	2.252	3.978	0.027	0.004	0.039	0.006	0.019	15.172
78	12	0.066	1.632	4.022	0.018	0.002	0.028	0.011	0.015	17.209
81		0.062	1.641	3.919	0.018	0.000	0.030	0.002	0.014	17.526
85	13	0.059	1.465	3.402	0.014	0.000	0.033	0.007	0.016	16.040
88		0.056	1.567	3.034	0.018	0.000	0.030	0.010	0.020	14.733
92	14	0.061	2.346	3.677	0.031	0.000	0.041	0.013	0.023	16.954
95		0.062	1.501	3.171	0.016	0.002	0.023	0.000	0.015	17.107
99	15	0.054	2.536	3.658	0.038	0.003	0.055	0.024	0.023	17.070
102		0.061	1.617	2.726	0.016	0.000	0.029	0.008	0.018	18.032
106	16	0.067	1.824	2.981	0.022	0.001	0.025	0.003	0.024	20.028
109		0.071	1.469	2.115	0.015	0.000	0.016	0.010	0.017	14.944
113	17	0.062	1.363	2.755	0.013	0.000	0.024	0.008	0.019	20.298
116		0.055	1.453	2.893	0.014	0.003	0.023	0.005	0.016	21.620
120	18	0.056	1.282	2.667	0.011	0.000	0.016	0.037	0.007	41.661
123		0.062	1.439	1.584	0.014	0.000	0.007	0.002	0.019	13.211
127	19	0.047	1.936	2.657	0.023	0.000	0.007	0.006	0.024	19.253
130		0.073	1.384	1.275	0.013	0.000	0.008	0.003	0.023	15.865
134	20	0.057	2.082	2.527	0.026	0.001	0.021	0.003	0.022	18.173
137		0.053	1.545	2.105	0.013	0.000	0.016	0.001	0.014	17.217
141	21	0.031	0.454	0.586	0.036	0.011	0.040	0.000	0.007	15.779
144		0.042	1.000	1.346	0.025	0.006	0.028	0.001	0.011	16.498
Initial conc.		2.400	90.000	357.900	0.000	0.000	8.800	27.800	32.000	20,499.900

TKW-26

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.043	8.689	10.651	0.224	0.023	0.448	0.000	0.008	17.204
4		0.058	2.190	8.104	0.064	0.019	0.166	0.044	0.021	0.281
8	2	0.067	2.462	8.147	0.081	0.033	0.243	0.020	0.017	7.251
11		0.149	1.870	8.795	0.058	0.033	0.126	0.030	0.015	6.647
15	3	0.063	0.146	7.216	0.025	0.018	0.102	0.024	0.016	7.443
18		0.049	0.081	8.484	0.023	0.019	0.085	0.026	0.015	7.746
22	4	0.047	1.946	8.355	0.059	0.027	0.285	0.028	0.016	7.607
25		0.115	2.954	14.674	0.088	0.151	0.228	0.018	0.017	8.100
29	5	0.062	2.412	9.320	0.067	0.022	0.101	0.025	0.015	7.905
32		0.067	2.944	9.750	0.078	0.027	0.097	0.024	0.016	8.416
36	6	0.059	3.880	10.216	0.098	0.023	0.143	0.019	0.016	8.321
39		0.079	1.896	8.551	0.058	0.007	0.089	0.023	0.018	8.666
43	7	0.075	5.620	10.487	0.136	0.012	0.145	0.016	0.017	10.073
46		0.060	3.023	8.934	0.083	0.015	0.123	0.040	0.018	8.529
50	8	0.055	5.071	10.144	0.125	0.021	0.161	0.019	0.017	8.768
53		0.070	5.740	10.892	0.138	0.030	0.139	0.026	0.018	8.785
57	9	0.057	4.811	10.262	0.119	0.038	0.141	0.018	0.017	9.334
60		0.076	4.098	9.889	0.104	0.010	0.162	0.022	0.018	9.460
64	10	0.054	2.294	9.228	0.068	0.028	0.114	0.009	0.017	9.608
67		0.062	5.302	10.761	0.128	0.051	0.150	0.011	0.015	10.248
71	11	0.054	4.101	9.109	0.105	0.020	0.160	0.021	0.018	10.707
74		0.077	4.979	10.319	0.135	0.029	0.136	0.040	0.017	9.017
78	12	0.076	5.932	9.900	0.143	0.023	0.184	0.019	0.018	10.684
81		0.055	3.884	9.254	0.101	0.019	0.134	0.028	0.019	9.418
85	13	0.053	2.832	8.023	0.079	0.010	0.149	0.033	0.017	10.320
88		0.073	2.634	7.362	0.077	0.019	0.199	0.020	0.017	9.748
92	14	0.068	2.807	7.478	0.079	0.020	0.164	0.020	0.017	9.341
95		0.059	4.605	8.427	0.124	0.019	0.190	0.023	0.017	9.980
99	15	0.065	3.671	8.288	0.095	0.026	0.178	0.029	0.019	9.982
102		0.059	4.749	8.602	0.124	0.010	0.215	0.015	0.018	10.066
106	16	0.063	2.312	7.242	0.068	0.012	0.142	0.000	0.010	13.077
109		0.068	3.500	7.522	0.093	0.016	0.138	0.000	0.008	16.055
113	17	0.065	2.641	7.163	0.076	0.030	0.161	0.000	0.009	15.730
116		0.148	2.650	6.762	0.074	0.016	0.147	0.000	0.008	16.591
120	18	0.059	7.485	9.747	0.177	0.000	0.195	0.000	0.008	15.600
123		0.065	3.144	6.986	0.087	0.028	0.153	0.003	0.012	16.330
127	19	0.062	3.232	6.495	0.087	0.032	0.135	0.000	0.009	15.866
130		0.053	3.624	6.898	0.095	0.026	0.164	0.000	0.007	15.750
134	20	0.059	4.069	7.739	0.105	0.035	0.171	0.000	0.009	16.037
137		0.052	4.736	7.778	0.120	0.037	0.194	0.000	0.010	17.953
141	21	0.058	4.407	7.949	0.110	0.025	0.197	0.000	0.010	16.147
144		0.008	4.390	9.130	.18.719	0.031	0.191	0.000	0.010	15.123
Initial conc.		5.900	1,562.200	1,015.500	8.800	0.900	0.400	46.600	22.100	10,791.100

TKW-27

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.280	0.441	26.386	0.077	0.099	0.106	0.129	0.287	0.810
4		0.255	3.604	8.495	0.106	0.112	0.283	0.154	0.108	0.306
8	2	0.281	0.316	7.239	0.056	0.120	0.052	0.030	0.001	0.166
11		0.266	1.876	6.244	0.087	0.131	0.101	0.081	0.036	0.192
15	3	0.269	0.104	6.528	0.075	0.123	0.058	0.154	0.000	0.113
18		0.262	0.084	5.053	0.061	0.115	0.061	0.000	0.000	0.275
22	4	0.265	1.871	6.470	0.105	0.098	0.111	0.117	0.048	0.239
25		0.283	3.285	5.887	0.137	0.141	0.115	0.080	0.076	0.623
29	5	0.254	1.669	6.065	0.109	0.099	0.096	0.095	0.049	0.366
32		0.158	1.302	4.917	0.099	0.012	0.063	0.052	0.014	0.332
36	6	0.127	3.201	6.381	0.132	0.063	0.175	0.037	0.023	35.961
39		0.080	3.801	5.129	0.126	0.050	0.181	0.037	0.023	27.295
43	7	0.086	2.863	5.584	0.125	0.060	0.173	0.021	0.019	33.469
46		0.090	4.307	4.168	0.137	0.052	0.192	0.033	0.026	26.943
50	8	0.084	4.537	5.101	0.164	0.053	0.196	0.050	0.025	28.530
53		0.085	7.395	4.948	0.225	0.044	0.273	0.034	0.033	21.366
57	9	0.098	3.685	4.816	0.151	0.044	0.220	0.027	0.021	25.064
60		0.079	8.527	5.201	0.279	0.052	0.273	0.035	0.038	21.063
64	10	0.080	3.744	4.882	0.188	0.053	0.225	0.043	0.023	25.241
67		0.058	7.842	4.627	0.272	0.054	0.276	0.054	0.036	17.904
71	11	0.081	3.796	4.206	0.189	0.046	0.254	0.022	0.023	19.643
74		0.098	8.198	4.155	0.284	0.059	0.289	0.050	0.038	14.118
78	12	0.065	4.232	3.931	0.209	0.049	0.236	0.032	0.023	16.940
81		0.067	2.449	4.236	0.657	0.053	0.241	0.034	0.032	11.820
85	13	0.086	5.221	3.386	0.231	0.050	0.256	0.041	0.025	11.777
88		0.089	7.913	3.806	0.333	0.051	0.267	0.056	0.037	12.075
92	14	0.085	7.996	4.094	0.351	0.059	0.294	0.053	0.040	13.855
95		0.071	8.152	3.896	0.364	0.043	0.278	0.055	0.040	12.941
99	15	0.080	4.936	4.567	0.397	0.043	0.249	0.027	0.029	19.212
102		0.089	6.036	3.892	0.397	0.050	0.257	0.026	0.033	14.469
106	16	0.093	5.537	4.333	0.447	0.044	0.257	0.034	0.032	17.503
109		0.083	4.222	3.348	0.411	0.047	0.233	0.031	0.028	13.834
113	17	0.071	2.962	5.470	0.744	0.047	0.218	0.020	0.023	24.967
116		0.080	6.383	3.553	0.241	0.051	0.272	0.020	0.022	19.077
120	18	0.064	1.655	6.021	1.617	0.045	0.243	0.004	0.020	28.036
123		0.090	5.330	5.889	1.196	0.059	0.305	0.030	0.034	22.605
127	19	0.077	2.324	8.596	2.306	0.049	0.288	0.013	0.026	35.877
130		0.075	0.811	7.679	2.560	0.044	0.252	0.014	0.021	30.825
134	20	0.068	1.346	14.403	6.272	0.048	0.363	0.006	0.033	52.362
137		0.083	2.052	13.791	7.246	0.053	0.393	0.016	0.043	41.145
141	21	0.134	1.127	20.875	13.750	0.066	0.566	0.019	0.079	58.208
144		0.065	1.924	22.251	17.601	0.047	0.644	0.017	0.125	54.559
Initial conc.		8.700	1,609.300	1,404.700	37.200	4.500	1.800	1,416.600	342.100	3,351.900

TKW-28

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.076	0.217	7.405	0.009	0.048	0.294	0.049	0.016	17.777
4		0.204	0.139	8.602	0.020	0.054	0.503	0.028	0.020	48.759
8	2	0.219	0.150	7.100	0.015	0.040	0.247	0.037	0.019	35.578
11		0.208	0.164	5.455	0.014	0.058	0.257	0.008	0.019	28.042
15	3	0.207	0.181	5.880	0.022	0.043	0.271	0.023	0.018	34.659
18		0.192	0.170	4.015	0.018	0.039	0.281	0.024	0.020	26.684
22	4	0.207	0.141	3.978	0.015	0.047	0.218	0.015	0.018	29.653
25		0.203	0.169	3.254	0.018	0.050	0.290	0.020	0.018	29.383
29	5	0.240	0.167	1.298	0.028	0.060	0.090	0.030	0.018	27.797
32		0.216	0.143	1.269	0.028	0.055	0.091	0.019	0.019	29.396
36	6	0.202	0.180	1.417	0.029	0.056	0.076	0.034	0.019	38.626
39		0.206	0.135	1.097	0.029	0.060	0.081	0.025	0.017	29.900
43	7	0.217	0.436	1.138	0.030	0.044	0.084	0.026	0.017	33.724
46		0.207	0.137	0.732	0.026	0.055	0.071	0.034	0.016	23.095
50	8	0.207	0.136	0.950	0.029	0.054	0.086	0.007	0.018	31.591
53		0.232	0.137	0.810	0.028	0.050	0.091	0.016	0.017	26.465
57	9	0.199	0.139	0.859	0.029	0.038	0.085	0.009	0.016	29.152
60		0.222	0.141	0.771	0.029	0.045	0.090	0.029	0.017	26.736
64	10	0.209	0.172	0.850	0.030	0.046	0.111	0.015	0.016	29.891
67		0.222	0.134	0.627	0.028	0.041	0.084	0.028	0.017	21.992
71	11	0.230	0.139	0.704	0.028	0.045	0.091	0.012	0.017	25.354
74		0.222	0.140	0.533	0.027	0.049	0.093	0.024	0.016	19.260
78	12	0.208	0.214	0.658	0.029	0.053	0.083	0.017	0.016	23.203
81		0.223	0.224	0.510	0.028	0.043	0.094	0.003	0.016	19.696
85	13	0.237	0.142	0.577	0.028	0.032	0.089	0.028	0.016	20.414
88		0.213	0.148	0.679	0.028	0.053	0.109	0.012	0.016	21.131
92	14	0.238	0.149	0.533	0.029	0.048	0.123	0.014	0.015	22.571
95		0.218	0.174	0.559	0.030	0.043	0.148	0.019	0.016	22.664
99	15	0.225	0.176	0.565	0.029	0.037	0.141	0.024	0.018	23.873
102		0.222	0.145	0.486	0.029	0.043	0.118	0.030	0.016	22.053
106	16	0.208	0.150	0.350	0.028	0.046	0.093	0.033	0.016	18.030
109		0.209	0.208	0.463	0.031	0.040	0.144	0.022	0.017	24.040
113	17	0.220	0.191	0.532	0.036	0.039	0.089	0.028	0.014	25.865
116		0.225	0.134	0.469	0.029	0.049	0.088	0.016	0.016	22.479
120	18	0.217	0.157	0.528	0.030	0.057	0.090	0.027	0.016	26.642
123		0.211	0.166	0.387	0.029	0.050	0.065	0.031	0.017	20.667
127	19	0.223	0.162	0.450	0.037	0.052	0.073	0.022	0.018	23.799
130		0.219	0.154	0.378	0.029	0.045	0.066	0.021	0.017	20.960
134	20	0.257	0.163	0.462	0.035	0.046	0.068	0.027	0.017	24.513
137		0.213	0.181	0.398	0.031	0.041	0.072	0.037	0.016	21.522
141	21	0.195	0.163	0.407	0.030	0.059	0.067	0.024	0.017	23.179
144		0.200	0.163	0.986	0.035	0.054	0.071	0.033	0.016	21.180
Initial conc.		0.000	1,642.000	68.500	35.200	1.100	1.300	49.100	24.700	17,971.800

TKW-29

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.102	0.328	31.782	0.066	0.049	0.212	0.020	0.020	18.322
4		0.174	2.810	12.279	0.075	0.059	0.433	0.010	0.014	4.279
8	2	0.177	0.380	9.953	0.033	0.054	0.182	0.003	0.003	2.879
11		0.178	0.756	8.090	0.036	0.059	0.176	0.002	0.000	2.260
15	3	0.137	0.491	8.266	0.034	0.047	0.114	0.017	0.000	2.726
18		0.134	0.456	3.705	0.033	0.048	0.104	0.011	0.000	1.487
22	4	0.164	0.411	9.272	0.036	0.042	0.120	0.005	0.003	2.934
25		0.167	0.632	6.633	0.037	0.055	0.142	0.008	0.000	2.207
29	5	0.173	0.499	6.110	0.036	0.053	0.118	0.014	0.001	2.026
32		0.167	0.750	6.275	0.038	0.057	0.125	0.021	0.002	1.982
36	6	0.167	0.565	6.155	0.037	0.060	0.086	0.000	0.010	2.256
39		0.162	0.475	5.550	0.034	0.053	0.104	0.021	0.000	1.961
43	7	0.181	0.488	6.073	0.037	0.047	0.111	0.009	0.000	2.399
46		0.151	0.514	4.529	0.035	0.041	0.087	0.005	0.000	1.807
50	8	0.177	0.421	5.582	0.036	0.063	0.089	0.012	0.007	2.417
53		0.159	0.696	4.556	0.038	0.043	0.108	0.008	0.009	1.935
57	9	0.157	0.969	5.514	0.043	0.048	0.125	0.011	0.008	2.572
60		0.157	0.516	4.601	0.040	0.060	0.110	0.013	0.007	2.104
64	10	0.165	0.471	5.328	0.037	0.046	0.130	0.004	0.003	2.625
67		0.179	0.576	4.402	0.037	0.049	0.120	0.021	0.009	2.171
71	11	0.156	0.573	5.098	0.040	0.052	0.033	0.003	0.000	2.758
74		0.140	0.814	4.435	0.044	0.045	0.128	0.000	0.002	2.400
78	12	0.140	0.485	4.714	0.041	0.037	0.129	0.023	0.000	2.992
81		0.140	0.718	4.135	0.043	0.046	0.114	0.013	0.006	2.400
85	13	0.181	0.510	3.469	0.044	0.062	0.119	0.010	0.000	2.272
88		0.138	1.177	3.829	0.049	0.053	0.143	0.005	0.006	2.031
92	14	0.148	0.619	4.261	0.046	0.038	0.144	0.013	0.003	2.971
95		0.143	0.671	3.783	0.048	0.044	0.172	0.009	0.004	2.766
99	15	0.126	0.442	4.640	0.053	0.043	0.168	0.006	0.009	3.918
102		0.123	0.510	3.820	0.051	0.048	0.167	0.000	0.009	3.100
106	16	0.119	0.409	4.152	0.057	0.056	0.166	0.009	0.003	5.495
109		0.124	0.456	3.642	0.058	0.053	0.160	0.004	0.009	3.192
113	17	0.126	0.375	5.064	0.072	0.061	0.173	0.000	0.016	4.901
116		0.117	0.399	4.043	0.065	0.052	0.156	0.016	0.006	3.692
120	18	0.112	0.359	4.388	0.071	0.050	0.162	0.005	0.006	3.901
123		0.113	0.449	4.749	0.080	0.049	0.202	0.003	0.007	3.869
127	19	0.114	0.539	5.110	0.089	0.047	0.242	0.000	0.007	3.836
130		0.109	0.415	3.429	0.064	0.038	0.138	0.010	0.012	2.771
134	20	0.126	0.416	4.303	0.076	0.049	0.178	0.002	0.012	3.082
137		0.110	0.405	3.204	0.067	0.061	0.230	0.000	0.001	2.401
141	21	0.113	0.309	4.079	0.077	0.067	0.191	0.025	0.007	3.648
144		0.066	0.117	0.005	0.023	0.050	0.021	0.006	0.007	2.476
Initial conc.		59.700	19,188.000	9,430.000	219.900	13.500	55.000	53.900	24.400	2,373.400

TKW-30

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.439	0.151	18.447	0.049	0.209	0.311	0.011	0.026	23.700
4		0.424	0.179	4.411	0.030	0.184	0.117	0.030	0.016	59.557
8	2	0.451	0.185	3.981	0.026	0.198	0.106	0.029	0.016	55.502
11		0.477	0.191	3.550	0.021	0.212	0.095	0.027	0.015	51.446
15	3	0.478	0.169	3.025	0.020	0.219	0.103	0.018	0.015	43.850
18		0.479	0.147	2.500	0.018	0.225	0.111	0.009	0.015	36.254
22	4	0.238	0.165	2.210	0.017	0.056	0.151	0.038	0.016	31.283
25		0.192	0.242	1.939	0.016	0.000	0.207	0.022	0.015	29.290
29	5	0.156	0.130	1.678	0.022	0.000	0.070	0.025	0.016	26.017
32		0.185	0.130	1.527	0.017	0.041	0.044	0.031	0.015	25.564
36	6	0.208	0.126	1.442	0.017	0.001	0.068	0.023	0.016	23.888
39		0.203	0.167	1.351	0.016	0.000	0.064	0.023	0.015	22.869
43	7	0.152	0.164	1.374	0.016	0.003	0.068	0.028	0.016	22.251
46		0.194	0.153	1.240	0.016	0.023	0.066	0.041	0.016	22.796
50	8	0.154	0.500	1.162	0.015	0.000	0.074	0.041	0.016	20.895
53		0.184	0.130	1.319	0.015	0.000	0.088	0.021	0.016	24.428
57	9	0.207	0.136	1.053	0.015	0.000	0.066	0.032	0.014	19.388
60		0.183	0.172	1.230	0.016	0.009	0.085	0.011	0.016	22.703
64	10	0.207	0.145	1.047	0.015	0.018	0.075	0.013	0.016	20.383
67		0.170	0.132	1.180	0.015	0.002	0.098	0.031	0.016	23.700
71	11	0.189	0.202	1.046	0.015	0.000	0.108	0.031	0.017	19.387
74		0.196	0.141	1.175	0.015	0.007	0.064	0.037	0.016	23.219
78	12	0.187	0.236	0.926	0.015	0.001	0.066	0.027	0.015	18.250
81		0.263	0.156	0.909	0.014	0.000	0.078	0.030	0.016	18.237
85	13	0.130	0.134	0.868	0.015	0.000	0.080	0.050	0.016	17.301
88		0.188	0.146	0.881	0.015	0.024	0.105	0.022	0.013	18.637
92	14	0.260	0.118	0.015	0.010	0.000	0.021	0.029	0.015	18.708
95		0.233	0.173	0.846	0.017	0.000	0.109	0.038	0.015	21.509
99	15	0.173	0.141	0.780	0.023	0.007	0.107	0.028	0.014	17.684
102		0.211	0.128	1.041	0.016	0.000	0.105	0.037	0.016	18.730
106	16	0.259	0.118	0.763	0.019	0.000	0.086	0.037	0.015	17.962
109		0.203	0.136	0.859	0.017	0.008	0.082	0.045	0.016	19.423
113	17	0.215	0.143	0.699	0.017	0.000	0.084	0.015	0.015	17.155
116		0.244	0.146	0.787	0.016	0.007	0.085	0.019	0.015	19.317
120	18	0.221	0.126	0.746	0.022	0.018	0.086	0.015	0.014	18.334
123		0.220	0.136	0.726	0.015	0.001	0.062	0.119	0.016	18.165
127	19	0.129	0.131	0.666	0.018	0.009	0.076	0.016	0.014	16.386
130		0.219	0.138	0.741	0.019	0.000	0.069	0.035	0.015	19.552
134	20	0.243	0.151	0.680	0.017	0.000	0.077	0.066	0.015	17.606
137		0.233	0.140	0.706	0.017	0.000	0.073	0.010	0.015	18.318
141	21	0.283	0.184	0.684	0.018	0.000	0.073	0.037	0.015	16.950
144		0.210	0.141	0.140	0.016	0.026	0.089	0.025	0.016	20.441
Initial conc.		2.100	29,256.600	6,335.600	708.700	6.600	40.900	128.100	16.900	26,067.000

TKW-59

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.000	3.560	77.420	5.140	0.173	4.236	0.227	0.238	392.273
4		0.000	14.973	96.652	3.302	0.000	3.868	0.202	0.228	227.202
8	2	0.069	6.979	30.461	1.499	0.213	1.891	0.176	0.218	62.130
11		0.084	0.921	27.215	2.742	0.104	1.629	0.156	0.228	70.343
15	3	0.158	4.588	16.116	2.576	0.169	2.199	0.203	0.246	67.169
18		0.073	26.734	18.052	6.249	0.116	3.118	0.250	0.263	63.995
22	4	0.134	11.450	9.430	2.790	0.095	6.023	0.198	0.276	66.521
25		0.045	77.700	59.700	45.500	0.009	12.568	0.156	0.400	72.152
29	5	0.000	147.500	66.800	58.800	0.176	17.711	0.147	0.608	67.483
32		0.076	273.500	61.200	16.500	0.300	28.785	0.136	0.681	66.784
36	6	0.181	3,695.000	4.587	4.256	0.424	18.857	0.173	0.919	45.814
39		0.391	7,191.700	7.211	5.712	0.684	25.865	0.112	1.505	81.271
43	7	0.122	5,386.500	4.645	2.533	0.718	7.877	0.202	0.777	37.148
46		0.243	6,318.300	5.677	1.980	0.729	8.686	0.120	0.555	32.203
50	8	0.182	4,246.500	5.592	0.742	0.477	7.381	0.171	0.291	21.444
53		0.149	3,071.500	5.451	0.422	0.420	6.094	0.038	0.234	16.254
57	9	0.131	4,020.000	8.954	0.620	0.463	5.496	0.169	0.225	24.321
60		0.140	1,801.500	4.781	0.280	0.245	7.872	0.117	0.243	13.356
64	10	0.054	663.600	2.844	0.181	0.174	3.538	0.134	0.214	8.311
67		0.150	1,599.600	6.097	0.309	0.246	6.541	0.195	0.229	16.079
71	11	0.077	1,311.800	6.668	0.375	0.196	4.623	0.192	0.227	13.191
74		0.070	1,306.300	5.909	0.350	0.168	7.000	0.131	0.227	11.747
78	12	0.158	1,100.500	5.735	0.409	0.187	5.080	0.106	0.228	12.758
81		0.058	1,268.100	4.080	0.319	0.117	4.331	0.163	0.225	7.726
85	13	0.123	779.100	5.642	0.496	0.060	3.935	0.226	0.231	9.228
88		0.119	423.200	2.358	0.188	0.174	4.763	0.189	0.230	4.720
92	14	0.114	1,418.000	3.297	0.239	0.212	4.259	0.098	0.218	6.636
95		0.112	527.700	2.329	0.156	0.065	4.273	0.139	0.244	5.401
99	15	0.171	352.700	4.119	0.317	0.226	4.845	0.123	0.229	7.972
102		0.050	827.400	2.492	0.188	0.047	3.152	0.140	0.221	5.790
106	16	0.087	473.800	3.895	0.313	0.103	3.887	0.065	0.218	7.950
109		0.133	706.500	3.515	0.308	0.152	4.027	0.113	0.230	6.907
113	17	0.121	843.600	2.905	0.246	0.154	2.800	0.216	0.233	5.259
116		0.027	556.100	3.158	0.390	0.241	4.806	0.145	0.221	6.634
120	18	0.100	1,303.600	3.496	0.399	0.164	3.873	0.136	0.226	6.397
123		0.117	722.000	2.697	0.284	0.197	2.818	0.094	0.230	5.317
127	19	0.079	753.800	3.369	0.318	0.148	4.368	0.172	0.234	6.883
130		0.045	440.700	2.563	0.225	0.119	2.770	0.146	0.230	4.652
134	20	0.065	498.000	3.211	0.279	0.207	2.186	0.240	0.230	6.644
137		0.048	1.100	9.504	0.975	0.295	11.171	0.065	0.292	25.611
141	21	0.033	61.063	3.369	0.102	0.007	0.466	0.151	0.226	3.631
144		0.041	17.330	1.984	0.590	0.015	0.307	0.195	0.231	4.606
Initial conc.		0.000	390,200.000	5,374.000	1,567.500	471.200	1,199.700	51,498.100	896.100	96,000.000

TKW-60

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.040	0.731	261.735	1.337	0.005	0.409	0.253	0.110	302.239
4		0.138	8.900	164.320	3.160	0.087	0.084	0.065	0.113	213.672
8	2	0.077	5.090	65.150	2.810	0.000	0.261	0.423	0.037	125.105
11		0.101	6.180	46.420	2.900	0.111	0.076	0.181	0.030	109.275
15	3	0.149	5.500	55.080	5.450	0.107	0.152	0.289	0.040	156.000
18		0.060	4.297	16.017	1.076	0.079	0.048	0.143	0.050	146.234
22	4	0.052	0.967	17.619	0.416	0.035	0.045	0.094	0.067	171.469
25		0.030	2.923	13.726	0.424	0.111	0.065	0.339	0.086	171.469
29	5	0.125	0.795	19.354	2.153	0.015	0.182	0.000	0.649	143.024
32		0.063	3.408	19.909	5.376	0.066	0.318	0.000	2.272	130.083
36	6	0.060	111.500	13.037	7.605	0.076	17.485	0.207	10.903	111.054
39		0.144	289.000	11.630	8.107	0.077	26.659	1.400	18.565	113.687
43	7	0.058	1,050.400	19.771	11.975	0.194	64.816	2.603	45.516	80.122
46		0.628	2,713.000	23.614	9.859	2.458	42.702	12.791	42.419	91.355
50	8	0.245	32,301.400	76.248	17.949	0.335	59.984	12.791	100.757	78.351
53		0.725	30,505.100	56.523	11.822	2.362	21.966	1.378	79.706	132.756
57	9	0.586	20,236.300	44.983	9.007	1.632	32.015	2.713	57.474	97.153
60		0.405	15,005.000	30.145	5.777	1.284	21.623	1.049	31.693	85.086
64	10	0.417	10,865.800	24.860	3.722	1.030	32.274	1.080	16.052	70.298
67		0.302	10,864.000	22.094	3.126	1.100	18.600	0.382	9.988	63.865
71	11	0.330	7,652.600	17.669	2.300	0.774	26.674	0.517	7.616	66.210
74		0.161	7,676.700	17.326	2.219	0.756	18.548	0.311	5.625	52.731
78	12	0.387	6,583.600	17.480	2.094	0.782	27.900	0.236	5.014	53.825
81		0.197	4,741.900	15.122	1.821	0.665	12.567	0.295	2.545	55.825
85	13	0.190	5,532.400	11.378	1.413	0.507	18.595	0.272	2.805	52.874
88		0.267	4,489.100	12.478	1.419	0.579	10.906	0.126	1.797	40.883
92	14	0.079	718.100	11.497	1.294	0.539	13.797	0.157	1.288	44.583
95		0.199	3,773.700	9.861	1.090	0.294	13.196	0.107	0.826	42.043
99	15	0.218	3,156.900	12.259	1.226	0.469	11.851	0.091	0.675	42.954
102		0.108	2,915.800	10.735	1.065	0.315	9.339	0.029	0.525	43.078
106	16	0.193	2,920.700	9.652	1.102	0.371	9.596	0.262	0.259	18.359
109		0.129	2,520.200	11.617	0.965	0.280	9.061	0.183	0.258	14.231
113	17	0.140	2,795.700	11.820	1.156	0.315	13.512	0.157	0.268	17.211
116		0.211	2,513.800	10.339	1.043	0.246	9.002	0.124	0.259	15.975
120	18	0.083	2,022.000	10.980	1.067	0.206	11.241	0.164	0.259	16.482
123		0.066	2,118.800	10.389	1.033	0.273	10.033	0.209	0.259	15.284
127	19	0.095	1,846.200	10.861	1.093	0.321	9.659	0.140	0.277	16.956
130		0.105	1,973.800	8.594	0.926	0.317	8.707	0.140	0.271	13.636
134	20	0.135	1,881.500	9.987	1.012	0.339	10.101	0.188	0.274	16.089
137		0.247	1,881.500	13.775	1.244	0.300	11.185	0.127	0.279	15.784
141	21	0.036	386.979	17.562	1.476	0.022	1.542	0.145	0.272	14.675
144		0.040	345.626	8.029	0.856	0.021	1.370	0.163	0.264	13.565
Initial conc.		4.800	398,270.000	10,780.000	4,750.000	272.000	225.500	51,366.600	510.800	356,540.000

TKW-61

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.119	14,444.989	3.661	0.154	0.345	2.596	0.101	0.687	49.501
4		0.000	2,013.000	3.160	0.566	1.730	13.040	0.016	2.097	1,773.000
8	2	0.000	1,646.000	4.180	0.466	1.558	18.236	0.058	1.287	214.783
11		0.040	1,501.000	4.740	0.589	1.165	14.231	0.040	1.010	766.000
15	3	0.000	1,056.000	5.290	0.370	0.870	14.554	0.053	0.120	182.000
18		0.000	996.000	3.880	0.236	0.730	13.269	0.077	0.087	398.000
22	4	0.000	845.000	5.300	0.277	0.745	4.618	0.090	0.302	434.000
25		0.335	836.000	4.860	0.246	0.980	5.408	0.000	0.246	51.626
29	5	0.092	692.000	3.200	0.246	0.581	5.627	0.000	0.426	787.000
32		0.131	447.000	2.410	0.214	0.680	7.637	0.000	0.391	375.000
36	6	0.140	3,963.600	3.751	0.182	0.364	7.077	0.235	0.231	14.823
39		0.124	2,675.800	4.459	0.223	0.384	6.585	0.214	0.244	16.493
43	7	0.144	3,019.500	3.426	0.181	0.231	7.425	0.225	0.230	11.680
46		0.187	2,267.000	4.951	0.278	0.330	4.879	0.181	0.240	14.255
50	8	0.186	3,434.300	4.220	0.266	0.294	5.230	0.082	0.221	14.232
53		0.178	2,844.500	4.623	0.272	0.353	5.356	0.116	0.232	12.691
57	9	0.187	2,921.000	3.336	0.199	0.191	7.224	0.092	0.230	8.707
60		0.234	1,727.000	3.886	0.233	0.287	6.026	0.084	0.234	9.799
64	10	0.180	2,148.000	3.764	0.244	0.255	7.619	0.085	0.234	9.791
67		0.037	2,222.300	4.053	0.278	0.237	6.403	0.212	0.234	9.956
71	11	0.330	2,513.600	2.519	0.174	0.774	26.647	0.197	0.238	6.329
74		0.150	1,078.600	3.097	0.221	0.177	6.680	0.147	0.254	8.262
78	12	0.183	1,792.900	2.785	0.221	0.270	9.240	0.214	0.250	8.099
81		0.138	1,682.400	2.800	0.243	0.267	6.799	0.102	0.260	6.913
85	13	0.162	2,129.700	2.156	0.195	0.194	5.655	0.180	0.239	4.671
88		0.195	1,418.400	2.091	0.200	0.303	6.765	0.147	0.254	5.123
92	14	0.100	1,482.300	1.806	0.171	0.192	4.664	0.148	0.242	4.305
95		0.101	1,399.500	3.941	0.355	0.353	4.944	0.151	0.250	8.522
99	15	0.139	3,509.200	2.427	0.216	0.239	5.785	0.124	0.228	4.598
102		0.076	1,760.200	2.818	0.240	0.222	5.195	0.185	0.236	4.701
106	16	0.062	1,841.900	2.206	0.185	0.134	7.353	0.188	0.235	8.810
109		0.000	1,188.100	2.189	0.189	0.293	7.095	0.188	0.231	6.702
113	17	0.181	1,178.700	2.756	0.232	0.159	5.241	0.120	0.226	10.127
116		0.156	1,702.600	3.192	0.282	0.287	6.936	0.130	0.223	10.988
120	18	0.167	2,169.600	2.513	0.220	0.339	6.024	0.116	0.232	7.670
123		0.107	1,477.000	2.327	0.188	0.179	7.499	0.126	0.225	6.302
127	19	0.192	1,133.400	3.515	0.275	0.288	4.788	0.186	0.238	9.519
130		0.141	1,795.900	2.450	0.200	0.373	5.766	0.230	0.225	6.277
134	20	0.096	1,093.000	2.889	0.229	0.264	6.489	0.291	0.236	8.277
137		0.048	615.701	0.000	0.121	0.158	6.938	0.127	0.231	7.491
141	21	0.044	138.401	2.743	0.225	0.207	6.593	0.090	0.239	5.841
144		0.048	30.760	2.263	0.196	0.010	0.408	0.112	0.095	2.502
Initial conc.		2,203.500	418,600.000	3,531.000	840.300	470.000	1,263.400	31,278.100	925.300	15,900.000

TKW-62

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.068	0.254	0.318	7.450	0.012	0.964	0.484	6.852	362.397
4		0.009	263.000	52.400	0.528	0.143	15.415	0.121	8.262	671.000
8	2	0.000	663.000	57.900	0.362	0.365	11.721	0.151	7.474	91.130
11		0.121	643.000	62.250	0.341	0.381	15.119	0.147	7.333	46.182
15	3	0.007	860.000	66.600	0.407	0.708	13.123	0.046	4.673	51.494
18		0.014	1,491.000	70.200	0.572	1.078	14.956	0.048	1.415	49.192
22	4	0.000	1,670.000	64.400	0.375	1.133	17.369	0.022	0.539	29.409
25		0.000	1,209.000	62.200	0.427	0.890	10.664	0.000	0.343	22.888
29	5	0.000	885.000	69.700	0.311	0.812	16.260	0.000	0.167	18.818
32		0.013	828.000	33.700	0.166	0.649	16.152	0.000	0.000	17.149
36	6	0.008	1,449.400	17.011	0.693	0.445	7.028	0.000	0.008	0.362
39		0.099	4,156.700	19.456	0.699	0.462	6.680	0.010	0.000	0.396
43	7	0.094	2,947.400	16.901	0.604	0.374	8.670	0.000	0.005	0.374
46		0.116	2,483.000	16.753	0.581	0.177	0.736	0.000	0.010	0.271
50	8	0.122	1,037.500	8.278	0.322	0.154	0.769	0.004	0.004	0.366
53		0.149	1,037.500	12.677	0.431	0.122	0.491	0.002	0.004	0.356
57	9	0.102	1,420.700	11.669	0.399	0.049	0.574	0.000	0.004	0.345
60		0.036	1,283.300	11.996	0.414	0.110	0.389	0.011	0.019	0.368
64	10	0.145	1,236.700	11.784	0.411	0.231	0.592	0.013	0.002	0.325
67		0.003	1,057.700	10.236	0.356	0.059	0.201	0.007	0.006	0.387
71	11	0.095	978.400	10.308	0.359	0.163	0.326	0.002	0.011	0.367
74		0.000	828.900	12.378	0.424	0.198	0.273	0.007	0.012	0.340
78	12	0.014	1,017.800	9.285	0.327	0.148	0.288	0.010	0.018	0.381
81		0.000	664.900	9.172	0.342	0.093	0.118	0.012	0.001	0.360
85	13	0.057	752.500	8.098	0.305	0.143	0.000	0.004	0.004	0.417
88		0.000	601.500	7.226	0.266	0.145	0.106	0.000	0.024	9.438
92	14	0.003	450.500	8.628	0.317	0.198	0.000	0.000	0.017	0.346
95		0.004	758.000	10.029	0.368	0.163	0.035	0.253	0.229	13.839
99	15	0.000	437.300	7.151	0.275	0.210	0.033	0.091	0.222	11.611
102		0.000	537.500	8.046	0.301	0.121	0.001	0.114	0.222	11.293
106	16	0.000	361.200	6.420	0.241	0.144	0.000	0.198	0.228	11.625
109		0.009	482.700	9.012	0.339	0.491	0.000	0.222	0.233	11.957
113	17	0.000	199.500	5.548	0.210	0.148	0.000	0.246	0.237	12.289
116		0.000	294.600	6.908	0.254	0.077	0.000	0.160	0.229	11.903
120	18	0.000	213.200	6.233	0.227	0.031	0.000	0.135	0.226	11.481
123		0.000	301.700	7.685	0.268	0.115	0.000	0.087	0.219	13.903
127	19	0.000	224.300	6.842	0.242	0.111	0.000	0.204	0.229	13.244
130		0.000	203.200	6.208	0.231	0.128	0.000	0.176	0.227	12.525
134	20	0.000	227.700	6.104	0.212	0.140	0.000	0.278	0.222	13.996
137		0.000	246.300	6.081	0.217	0.054	0.000	0.185	0.227	13.781
141	21	0.000	237.000	6.503	0.220	0.097	0.000	0.228	0.234	12.914
144		0.000	241.650	5.794	0.210	0.076	0.000	0.238	0.237	15.745
Initial conc.		28.700	35,721.800	9,671.700	2,703.200	458.700	1,704.900	113,393.800	577.000	147,000.00

TKW-39

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.000	7.790	1,270.870	5.920	0.064	2.814	0.611	0.048	363.010
4		0.013	6.100	994.270	7.790	0.142	4.238	0.450	0.027	35.620
8	2	0.040	4.200	203.170	3.170	0.000	2.104	0.158	0.016	103.335
11		0.128	8.400	133.710	4.750	0.000	3.262	0.172	0.128	75.454
15	3	0.580	5.870	60.770	3.390	0.104	2.040	0.042	0.025	168.210
18		0.097	4.820	64.860	2.500	0.025	2.951	0.112	0.007	389.350
22	4	0.000	6.390	61.620	3.350	0.045	2.860	0.309	0.008	294.330
25		0.166	3.320	53.850	4.220	0.111	0.065	0.147	0.027	215.160
29	5	0.037	4.980	45.860	3.980	0.012	2.880	0.229	0.002	747.510
32		0.030	1.950	46.600	3.060	0.189	2.160	0.052	0.020	478.055
36	6	0.065	0.424	9.306	0.176	0.040	0.176	0.005	0.006	208.600
39		0.050	0.273	12.946	0.308	0.034	0.233	0.006	0.006	242.180
43	7	0.041	0.329	9.713	0.220	0.025	0.229	0.003	0.005	170.760
46		0.032	0.313	16.670	0.411	0.033	0.298	0.009	0.004	221.560
50	8	0.039	2.031	11.847	0.349	0.054	0.285	0.008	0.010	176.630
53		0.018	0.353	15.114	0.430	0.052	0.264	0.007	0.006	202.790
57	9	0.000	0.451	13.594	0.404	0.035	0.297	0.002	0.004	204.600
60		0.041	0.194	16.411	0.531	0.040	0.314	0.000	0.004	192.160
64	10	0.028	0.533	12.423	0.418	0.037	0.318	0.005	0.006	144.090
67		0.014	1.078	13.532	0.512	0.041	0.318	0.007	0.005	155.680
71	11	0.025	0.500	11.728	0.471	0.046	0.330	0.000	0.007	123.290
74		0.037	0.469	14.834	0.550	0.031	0.342	0.003	0.007	105.720
78	12	0.019	0.377	10.666	0.472	0.027	0.309	0.000	0.007	189.910
81		0.032	0.414	11.498	0.584	0.021	0.351	0.006	0.006	196.312
85	13	0.042	0.985	10.216	0.564	0.030	0.518	0.016	0.007	222.283
88		0.032	0.825	9.541	0.599	0.034	0.580	0.018	0.007	200.800
92	14	0.022	0.664	8.865	0.633	0.037	0.642	0.106	0.012	236.327
95		0.026	0.343	11.142	0.839	0.049	0.460	0.011	0.007	206.262
99	15	0.014	0.313	7.907	0.585	0.023	0.393	0.022	0.010	241.119
102		0.028	0.428	9.048	0.705	0.053	0.353	0.016	0.010	204.000
106	16	0.030	0.753	7.336	0.637	0.027	0.350	0.019	0.008	234.000
109		0.023	0.500	10.021	0.885	0.022	0.389	0.022	0.006	234.000
113	17	0.020	0.585	6.579	0.640	0.062	0.354	0.025	0.008	215.000
116		0.000	0.459	8.397	0.826	0.046	0.389	0.023	0.008	250.000
120	18	0.007	0.611	7.024	0.777	0.042	0.370	0.022	0.008	201.000
123		0.019	0.360	9.030	1.045	0.039	0.403	0.017	0.010	246.000
127	19	0.020	1.284	5.679	0.706	0.057	0.370	0.022	0.005	173.000
130		0.008	0.306	11.114	1.309	0.032	0.422	0.020	0.011	301.000
134	20	0.021	0.455	6.136	0.806	0.050	0.366	0.025	0.009	231.000
137		0.000	0.464	7.001	0.930	0.050	0.387	0.013	0.010	245.000
141	21	0.125	0.173	5.520	0.802	0.046	0.359	0.010	0.007	185.000
144		0.010	0.277	8.464	1.229	0.048	0.453	0.036	0.007	273.000
Initial conc.		6.800	631,670.000	48,802.000	5,511.000	304.400	1,121.000	1,802.500	79.700	13,671.500

TKW-40

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.059	0.137	129.213	1.273	0.033	0.280	0.016	0.110	821.639
4		0.057	1.869	40.081	0.812	0.015	0.369	0.065	0.036	602.759
8	2	0.060	0.388	18.025	1.219	0.058	0.427	0.028	0.045	547.234
11		0.069	0.535	9.222	0.599	0.000	0.500	0.040	0.029	295.299
15	3	0.058	0.993	6.540	0.702	0.010	0.461	0.043	0.035	240.380
18		0.080	0.388	5.427	1.055	0.031	0.527	0.035	0.047	308.663
22	4	0.055	1.313	3.807	0.774	0.024	0.425	0.051	0.031	207.774
25		0.072	0.323	3.635	1.519	0.014	0.598	0.031	0.060	257.352
29	5	0.062	3.517	2.489	0.710	0.015	0.400	0.021	0.029	293.076
32		0.069	0.224	2.274	0.735	0.003	0.286	0.027	0.030	245.197
36	6	0.069	0.376	1.624	0.527	0.019	0.339	0.048	0.027	188.119
39		0.071	0.270	1.884	0.635	0.021	0.325	0.033	0.028	251.810
43	7	0.053	0.667	1.312	0.580	0.018	0.335	0.048	0.260	184.821
46		0.070	0.737	1.424	0.566	0.023	0.302	0.039	0.024	151.884
50	8	0.056	0.364	1.148	0.534	0.016	0.334	0.047	0.024	192.111
53		0.059	0.261	1.634	0.912	0.029	0.384	0.037	0.031	143.755
57	9	0.162	0.408	0.994	0.424	0.041	0.330	0.039	0.020	138.165
60		0.070	0.309	1.576	1.000	0.018	0.393	0.027	0.029	161.451
64	10	0.065	0.215	1.078	0.572	0.038	0.276	0.026	0.024	130.178
67		0.065	0.973	1.069	0.620	0.037	0.311	0.018	0.024	115.193
71	11	0.067	0.357	1.004	0.539	0.039	0.269	0.022	0.022	100.038
74		0.076	0.654	1.238	0.911	0.032	0.247	0.027	0.031	106.579
78	12	0.042	0.403	0.960	0.542	0.000	0.236	0.041	0.023	45.538
81		0.056	0.543	1.048	0.634	0.025	0.262	0.049	0.024	48.794
85	13	0.068	1.034	1.320	0.651	0.024	0.348	0.053	0.023	40.237
88		0.075	0.605	1.422	0.127	0.018	0.261	0.079	0.377	46.019
92	14	0.067	0.931	2.131	1.981	0.024	0.371	0.186	0.463	38.203
95		0.061	0.688	2.803	5.446	0.012	1.466	2.440	0.830	39.156
99	15	0.071	0.490	2.423	5.830	0.030	3.206	8.420	0.730	27.524
102		0.050	0.085	2.690	7.854	0.029	12.447	24.759	0.797	29.133
106	16	0.064	0.155	2.369	6.944	0.038	16.166	30.715	0.692	26.452
109		0.068	0.174	3.041	6.927	0.038	20.349	36.671	0.586	23.771
113	17	0.058	0.298	3.001	5.183	0.020	15.974	65.328	0.654	25.237
116		0.060	0.229	4.234	3.046	0.020	17.276	65.181	0.495	22.938
120	18	0.058	0.111	3.722	5.276	0.014	13.145	88.146	0.539	22.748
123		0.067	0.287	4.489	5.661	0.029	11.972	77.690	0.420	19.121
127	19	0.069	0.147	3.896	4.464	0.021	11.730	96.057	0.571	21.855
130		0.079	0.112	6.326	6.462	0.037	11.488	114.423	0.722	24.588
134	20	0.093	0.131	5.320	6.189	0.000	9.637	97.351	0.613	22.557
137		.0.047	0.286	5.755	6.388	0.011	8.797	88.994	0.402	25.091
141	21	0.073	0.156	4.313	5.008	0.016	7.171	101.497	0.445	26.746
144		0.066	0.352	8.431	8.055	0.037	10.110	114.000	0.488	28.400
Initial conc.		7.600	214,494.100	527.800	1,018.200	13.500	134.700	2,353.900	28.500	23,207.600

TKW-41

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.062	0.200	31.496	0.033	0.047	0.217	0.008	0.013	75.733
4		0.067	0.932	12.100	0.036	0.069	0.277	0.004	0.000	24.079
8	2	0.075	0.673	8.499	0.029	0.063	0.323	0.000	0.000	16.836
11		0.079	0.871	7.423	0.031	0.051	0.217	0.000	0.000	15.533
15	3	0.089	1.216	8.348	0.045	0.047	0.272	0.003	0.000	16.928
18		0.086	1.115	7.840	0.039	0.057	0.282	0.019	0.000	17.856
22	4	0.089	1.129	7.079	0.041	0.040	0.244	0.014	0.000	17.236
25		0.070	0.209	6.486	0.019	0.053	0.163	0.000	0.000	16.783
29	5	0.070	1.168	6.443	0.042	0.053	0.242	0.016	0.000	18.294
32		0.088	0.793	5.846	0.034	0.048	0.195	0.015	0.000	19.395
36	6	0.083	0.980	5.061	0.038	0.034	0.206	0.009	0.000	18.637
39		0.085	1.474	4.884	0.037	0.052	0.226	0.000	0.000	18.823
43	7	0.059	0.758	4.830	0.026	0.065	0.183	0.008	0.000	19.286
46		0.061	2.402	5.352	0.052	0.056	0.227	0.000	0.000	22.705
50	8	0.066	1.761	5.165	0.048	0.060	0.219	0.000	0.000	23.356
53		0.072	0.571	4.752	0.029	0.043	0.206	0.016	0.000	21.890
57	9	0.074	0.820	3.890	0.033	0.050	0.185	0.000	0.000	20.358
60		0.062	0.597	4.462	0.033	0.058	0.189	0.000	0.000	20.074
64	10	0.078	0.824	3.283	0.033	0.051	0.198	0.000	0.000	19.789
67		0.090	0.695	3.439	0.033	0.067	0.192	0.005	0.000	21.530
71	11	0.065	1.137	3.127	0.033	0.058	0.195	0.008	0.000	20.158
74		0.083	0.917	3.485	0.035	0.049	0.191	0.012	0.000	24.054
78	12	0.065	0.844	2.890	0.035	0.063	0.188	0.010	0.000	19.970
81		0.060	0.775	2.816	0.037	0.049	0.206	0.013	0.000	21.605
85	13	0.084	1.051	2.661	0.043	0.036	0.214	0.010	0.000	20.960
88		0.087	0.993	2.631	0.045	0.037	0.269	0.010	0.000	22.880
92	14	0.145	1.991	2.470	0.049	0.045	0.249	0.012	0.000	24.723
95		0.061	0.647	2.491	0.036	0.040	0.196	0.012	0.000	23.735
99	15	0.079	1.302	2.320	0.052	0.057	0.234	0.008	0.000	28.707
102		0.081	1.151	2.344	0.049	0.050	0.224	0.027	0.000	26.791
106	16	0.069	1.094	2.243	0.052	0.054	0.234	0.029	0.000	25.826
109		0.065	1.483	2.322	0.064	0.061	0.240	0.072	0.000	29.324
113	17	0.075	0.988	2.132	0.055	0.043	0.211	0.077	0.000	27.596
116		0.068	1.638	1.929	0.068	0.052	0.213	0.027	0.000	26.943
120	18	0.064	2.005	1.973	0.079	0.052	0.234	0.034	0.000	27.172
123		0.084	1.887	2.018	0.077	0.051	0.202	0.118	0.000	26.059
127	19	0.082	5.630	2.008	0.163	0.054	0.351	0.032	0.000	29.043
130		0.075	3.361	1.906	0.108	0.058	0.225	0.071	0.000	27.884
134	20	0.072	3.495	1.730	0.113	0.057	0.247	0.191	0.000	27.677
137		0.109	3.111	1.767	0.112	0.038	0.227	0.218	0.000	27.310
141	21	0.072	3.334	1.757	0.115	0.051	0.219	0.087	0.000	27.274
144		0.056	1.976	1.681	0.075	0.050	0.175	0.047	0.000	26.437
Initial conc.		8.700	177,544.600	751.500	1,135.000	10.800	36.200	126.100	18.400	25,157.900

TKW-44

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.010	0.080	70.115	0.608	0.065	0.484	0.000	0.000	208.890
4		0.000	10.109	24.647	0.528	0.055	0.961	0.058	0.000	67.112
8	2	0.000	1.171	12.761	0.142	0.040	0.886	0.008	0.000	34.762
11		0.015	0.564	14.401	0.138	0.034	0.288	0.005	0.000	41.937
15	3	0.009	1.890	11.867	0.174	0.064	0.366	0.008	0.000	35.667
18		0.010	5.868	12.611	0.196	0.048	0.418	0.010	0.000	40.741
22	4	0.026	2.043	11.399	0.200	0.061	0.287	0.010	0.000	42.789
25		0.000	1.113	12.448	0.182	0.062	0.298	0.003	0.000	49.994
29	5	0.008	1.170	11.809	0.222	0.029	0.224	0.000	0.000	48.914
32		0.011	0.679	13.669	0.263	0.055	0.216	0.000	0.000	52.831
36	6	0.020	1.500	9.913	0.251	0.055	0.215	0.000	0.000	48.505
39		0.006	0.808	11.099	0.202	0.053	0.198	0.002	0.000	56.431
43	7	0.030	1.509	8.105	0.201	0.051	0.252	0.000	0.000	49.542
46		0.028	1.195	9.540	0.241	0.028	0.239	0.014	0.000	55.036
50	8	0.032	1.152	8.504	0.223	0.032	0.237	0.000	0.000	39.376
53		0.018	0.860	9.301	0.251	0.047	0.261	0.002	0.000	46.584
57	9	0.030	1.035	8.144	0.241	0.040	0.289	0.118	0.000	40.315
60		0.001	1.860	8.078	0.261	0.046	0.357	0.012	0.000	42.560
64	10	0.001	1.967	6.302	0.217	0.063	0.330	0.011	0.000	36.975
67		0.022	1.279	5.837	0.190	0.061	0.278	0.009	0.000	36.903
71	11	0.015	1.678	5.072	0.186	0.054	0.296	0.010	0.000	31.962
74		0.015	1.226	5.226	0.174	0.056	0.226	0.009	0.000	29.751
78	12	0.026	1.776	4.865	0.195	0.054	0.255	0.003	0.000	27.540
81		0.037	2.326	4.503	0.215	0.052	0.284	0.010	0.000	30.617
85	13	0.031	2.018	4.357	0.183	0.040	0.372	0.017	0.000	30.141
88		0.018	1.447	4.298	0.199	0.069	0.262	0.005	0.000	30.725
92	14	0.018	3.003	4.084	0.229	0.047	0.362	0.020	0.007	31.971
95		0.010	2.905	4.243	0.195	0.057	0.299	0.016	0.005	38.241
99	15	0.042	1.935	3.500	0.189	0.057	0.190	0.014	0.007	20.657
102		0.000	1.885	3.501	0.187	0.048	0.277	0.014	0.007	15.336
106	16	0.011	2.357	3.392	0.107	0.063	0.290	0.037	0.007	41.661
109		0.034	1.708	3.474	0.197	0.026	0.230	0.024	0.003	14.454
113	17	0.019	1.696	3.145	0.186	0.055	0.234	0.013	0.006	12.130
116		0.037	3.842	3.606	0.213	0.029	0.319	0.011	0.006	12.380
120	18	0.029	2.713	3.291	0.229	0.048	0.324	0.011	0.008	10.007
123		0.034	0.871	1.076	0.061	0.010	0.098	0.007	0.006	9.512
127	19	0.018	2.323	2.965	0.208	0.022	0.299	0.014	0.006	7.694
130		0.010	1.947	3.370	0.215	0.057	0.233	0.006	0.006	8.227
134	20	0.010	2.608	2.925	0.211	0.048	0.278	0.003	0.007	6.471
137		0.017	3.060	3.157	0.229	0.043	0.223	0.012	0.005	6.083
141	21	0.013	2.580	2.843	0.210	0.036	0.235	0.005	0.003	5.168
144		0.000	3.277	2.657	0.232	0.061	0.199	0.026	0.008	4.740
Initial conc.		3.800	80,097.400	4,559.900	1,140.000	10.000	74.100	256.300	16.700	13,764.300

TKW-46

Days	Cycles	Concentration (mg/L)								
		As	Fe	Mg	Mn	Pb	Zn	Cu	Co	Ca
1	1	0.527	5.224	3.532	0.040	0.164	0.217	0.006	0.018	4.276
4		0.503	13.678	4.448	0.104	0.111	0.202	0.017	0.024	2.055
8	2	0.633	0.788	0.592	0.001	0.125	0.034	0.018	0.016	0.658
11		0.714	0.604	0.613	0.002	0.000	0.041	0.016	0.017	1.171
15	3	0.794	0.435	0.368	0.000	0.000	0.023	0.002	0.015	0.534
18		0.795	0.128	0.294	0.000	0.000	0.013	0.007	0.011	0.361
22	4	0.851	2.158	1.041	0.011	0.000	0.000	0.000	0.015	0.737
25		0.649	0.594	0.528	0.000	0.000	0.000	0.008	0.014	0.496
29	5	0.577	0.100	0.264	0.000	0.000	0.000	0.009	0.010	0.661
32		0.603	0.096	0.137	0.000	0.000	0.000	0.009	0.012	0.715
36	6	0.615	0.170	0.139	0.000	0.000	0.000	0.004	0.012	0.686
39		0.612	0.073	0.116	0.000	0.000	0.000	0.005	0.009	0.889
43	7	0.645	0.062	0.003	0.000	0.000	0.000	0.019	0.029	2.236
46		0.643	1.928	1.056	0.019	0.781	0.011	0.013	0.022	1.566
50	8	0.320	5.924	2.224	0.054	0.143	0.099	0.013	0.018	1.482
53		0.249	6.855	2.232	0.060	0.175	0.184	0.014	0.018	1.275
57	9	0.242	19.643	5.433	0.151	0.176	0.218	0.019	0.034	2.174
60		0.219	5.491	1.999	0.060	0.169	0.106	0.006	0.016	1.105
64	10	0.310	7.436	2.606	0.064	0.146	0.133	0.015	0.020	1.410
67		0.241	7.392	2.436	0.062	0.150	0.126	0.013	0.018	1.294
71	11	0.289	13.914	3.796	0.104	0.000	0.181	0.000	0.025	1.814
74		0.250	11.256	3.484	0.090	0.058	0.157	0.014	0.025	1.424
78	12	0.308	7.504	2.492	0.063	0.095	0.122	0.001	0.017	0.589
81		0.258	5.063	1.948	0.047	0.144	0.100	0.008	0.013	0.472
85	13	0.276	4.854	1.814	0.044	0.186	0.037	0.011	0.009	0.398
88		0.268	11.798	3.503	0.094	0.208	0.158	0.010	0.025	0.495
92	14	0.323	3.173	1.427	0.032	0.245	0.087	0.009	0.009	0.239
95		0.363	10.891	3.484	0.088	0.216	0.177	0.005	0.022	0.391
99	15	0.360	3.452	1.484	0.035	0.191	0.097	0.007	0.009	0.180
102		0.309	8.419	2.901	0.070	0.215	0.149	0.000	0.020	0.238
106	16	0.324	3.570	1.604	0.036	0.191	0.107	0.016	0.017	1.271
109		0.419	2.156	1.215	0.026	0.222	0.080	0.003	0.014	1.095
113	17	0.410	4.205	1.609	0.040	0.195	0.134	0.006	0.017	1.184
116		0.475	8.952	3.189	0.077	0.212	0.189	0.014	0.021	1.560
120	18	0.418	3.284	1.790	0.034	0.221	0.098	0.020	0.018	1.367
123		0.387	4.697	1.892	0.043	0.232	0.121	0.010	0.017	1.416
127	19	0.396	3.521	1.635	0.036	0.218	0.100	0.013	0.018	1.338
130		0.440	4.000	1.881	0.040	0.236	0.106	0.010	0.017	1.363
134	20	0.412	5.766	2.129	0.053	0.235	0.130	0.008	0.018	1.416
137		0.474	7.385	2.623	0.064	0.241	0.147	0.020	0.019	1.521
141	21	0.451	4.553	1.846	0.043	0.273	0.117	0.012	0.018	1.256
144		0.453	6.993	2.451	0.061	0.232	0.135	0.011	0.019	1.445
Initial conc.		3.000	41,501.400	8,685.300	262.200	6.200	54.300	9.500	18.300	3,358.100

APPENDIX C

Sulfate concentration

(Anaylyzed by EPA Method 9308)

TKW-2

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	0.121	17.455	1	258.587	258.587	0.151	3.937	0.018	4.106	60.830	60.830
4		0.045	8.086	1	119.799	378.386	0.021	1.151	0.018	5.296	78.459	139.289
8	2	0.085	13.017	1	192.845	571.231	13.178	3.353	0.017	21.844	323.615	462.904
11		0.062	10.182	1	150.844	722.075	10.730	2.630	0.017	35.221	521.793	984.696
15	3	0.084	12.894	1	191.019	913.094	11.224	2.701	0.017	49.163	728.341	1713.037
18		0.030	6.237	1	92.407	1005.501	10.699	2.693	0.017	62.572	926.993	2640.030
22	4	0.108	15.852	1	234.847	1240.347	9.881	2.774	0.018	75.245	1114.741	3754.770
25		0.056	9.442	1	139.887	1380.234	11.682	2.758	0.018	89.703	1328.933	5083.704
29	5	0.092	13.880	1	205.628	1585.862	10.146	2.164	0.017	102.030	1511.556	6595.259
32		0.045	8.086	1	119.799	1705.661	10.820	2.584	0.017	115.451	1710.385	8305.644
36	6	0.052	8.949	1	132.582	1838.244	10.143	2.573	0.017	128.184	1899.022	10204.667
39		0.044	7.963	1	117.973	1956.217	10.186	2.584	0.018	140.972	2088.474	12293.141
43	7	0.086	13.140	1	194.671	2150.888	9.438	2.887	0.017	153.314	2271.319	14564.459
46		0.076	11.908	1	176.410	2327.298	9.843	2.710	0.017	165.884	2457.541	17022.000
50	8	0.040	7.470	1	110.668	2437.966	9.694	2.876	0.017	178.471	2644.015	19666.015
53		0.048	8.456	1	125.278	2563.244	9.438	2.631	0.017	190.557	2823.067	22489.081
57	9	0.072	11.415	1	169.105	2732.349	10.169	2.735	0.014	203.475	3014.444	25503.526
60		0.103	15.236	1	225.716	2958.065	10.186	2.811	0.017	216.489	3207.244	28710.770
64	10	0.113	16.468	1	243.977	3202.042	9.744	2.092	0.017	228.342	3382.844	32093.615
67		0.178	24.481	1	362.677	3564.719	9.718	2.387	0.017	240.464	3562.430	35656.044
71	11	0.220	29.658	1	439.375	4004.095	9.181	2.097	0.017	251.759	3729.763	39385.807
74		0.190	25.960	1	384.591	4388.686	8.048	1.815	0.017	261.639	3876.133	43261.941
78	12	0.320	41.984	1	621.990	5010.676	8.408	1.859	0.018	271.924	4028.504	47290.444
81		0.320	41.984	1	621.990	5632.667	8.728	1.816	0.019	282.487	4184.993	51475.437

TKW-2

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.350	45.682	1	676.775	6309.441	7.662	1.655	0.018	291.822	4323.289	55798.726
88		0.049	8.580	1	127.104	6436.545	9.278	2.214	0.018	303.332	4493.807	60292.533
92	14	0.041	7.593	1	112.495	6549.040	9.324	2.192	0.017	314.865	4664.667	64957.200
95		0.011	3.895	1	57.710	6606.750	13.254	2.280	0.018	330.417	4895.067	69852.267
99	15	0.087	13.264	1	196.497	6803.247	8.639	2.244	0.017	341.317	5056.548	74908.815
102		0.039	7.347	1	108.842	6912.090	9.226	2.446	0.017	353.006	5229.719	80138.533
106	16	0.180	24.727	1	366.329	7278.419	8.032	2.366	0.018	363.422	5384.030	85522.563
109		0.049	8.580	1	127.104	7405.523	0.205	2.398	0.018	366.043	5422.859	90945.422
113	17	0.066	10.675	1	158.148	7563.671	8.668	2.212	0.017	376.940	5584.296	96529.719
116		0.080	12.401	1	183.714	7747.385	9.688	2.375	0.017	389.020	5763.259	102292.978
120	18	0.105	15.482	1	229.368	7976.754	8.609	2.141	0.017	399.787	5922.770	108215.748
123		0.289	38.163	1	565.380	8542.133	9.131	2.188	0.017	411.123	6090.711	114306.459
127	19	0.115	16.715	1	247.630	8789.763	9.202	2.304	0.017	422.646	6261.422	120567.881
130		0.050	8.703	1	128.930	8918.693	8.876	2.199	0.017	433.738	6425.748	126993.630
134	20	0.054	9.196	1	136.235	9054.928	8.866	2.035	0.017	444.656	6587.496	133581.126
137		0.109	15.975	1	236.673	9291.600	9.893	2.311	0.017	456.877	6768.548	140349.674
141	21	0.063	10.305	1	152.670	9444.270	8.553	2.030	0.017	467.477	6925.585	147275.259
144		0.066	10.675	1	158.148	9602.418	8.314	2.040	0.017	477.848	7079.230	154354.489
Initial conc.			1198.300				20499.900	357.900	0.000	20857.800		

TKW-6

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	0.152	21.276	1	315.197	315.197	5.570	16.722	0.000	22.292	330.252	330.252
4		0.143	20.166	1	298.762	335.364	2.910	11.755	0.007	36.964	547.615	877.867
8	2	0.158	22.015	1	326.154	357.379	2.930	4.548	0.001	44.443	658.415	1536.281
11		0.120	17.331	1	256.760	374.710	0.000	8.295	0.005	52.743	781.378	2317.659
15	3	0.129	18.441	1	273.196	393.151	10.130	9.428	0.000	72.301	1071.126	3388.785
18		0.141	19.920	1	295.110	413.071	6.400	8.568	0.000	87.269	1292.874	4681.659
22	4	0.091	13.757	1	203.802	426.828	8.100	7.879	0.000	103.248	1529.600	6211.259
25		0.103	15.236	1	225.716	442.063	6.040	1.333	0.000	110.621	1638.830	7850.089
29	5	0.138	19.550	1	289.631	461.614	4.770	6.989	0.000	122.380	1813.037	9663.126
32		0.145	20.413	1	302.414	482.027	8.240	6.811	0.000	137.431	2036.015	11699.141
36	6	0.161	22.385	1	331.633	504.412	8.681	5.509	0.000	151.621	2246.237	13945.378
39		0.088	13.387	1	198.324	517.799	7.918	5.143	0.000	164.682	2439.733	16385.111
43	7	0.087	13.264	1	196.497	531.062	7.556	5.229	0.000	177.467	2629.141	19014.252
46		0.097	14.496	1	214.759	545.558	7.764	5.173	0.000	190.404	2820.800	21835.052
50	8	0.145	20.413	1	302.414	565.971	7.306	5.068	0.000	202.778	3004.119	24839.170
53		0.083	12.771	1	189.193	578.742	8.038	5.358	0.000	216.174	3202.578	28041.748
57	9	0.072	11.415	1	169.105	590.156	8.006	5.272	0.000	229.452	3399.289	31441.037
60		0.046	8.210	1	121.625	598.366	7.914	5.303	0.000	242.669	3595.096	35036.133
64	10	0.029	6.114	1	90.581	604.480	7.662	5.251	0.000	255.582	3786.400	38822.533
67		0.076	11.908	1	176.410	616.388	7.758	5.192	0.000	268.532	3978.252	42800.785
71	11	0.037	7.100	1	105.190	623.488	6.960	4.744	0.000	280.236	4151.644	46952.430
74		0.043	7.840	1	116.147	631.328	7.126	4.554	0.000	291.916	4324.681	51277.111
78	12	0.055	9.319	1	138.061	640.647	7.239	4.487	0.000	303.642	4498.400	55775.511
81		0.770	97.454	1	1443.758	738.101	6.927	4.406	0.000	314.975	4666.296	60441.807

TKW-6

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.058	9.689	1	143.539	747.790	6.819	4.209	0.000	326.003	4829.674	65271.481
88		0.065	10.552	1	156.322	758.342	6.937	4.341	0.000	337.281	4996.756	70268.237
92	14	0.032	6.484	1	96.059	764.826	6.216	3.922	0.000	347.419	5146.948	75415.185
95		0.625	79.580	1	1178.966	844.406	6.932	4.171	0.000	358.522	5311.437	80726.622
99	15	0.077	12.031	1	178.236	856.437	6.029	3.685	0.000	368.236	5455.348	86181.970
102		0.051	8.826	1	130.756	865.263	6.243	3.868	0.000	378.347	5605.141	91787.111
106	16	0.039	7.347	1	108.842	872.610	6.625	4.098	0.000	389.070	5764.000	97551.111
109		0.022	5.251	1	77.798	877.861	6.420	3.992	0.000	399.482	5918.252	103469.363
113	17	0.068	10.922	1	161.801	888.783	6.433	4.110	0.000	410.025	6074.444	109543.807
116		0.206	27.932	1	413.809	916.715	14.478	4.579	0.000	429.082	6356.770	115900.578
120	18	0.181	24.851	1	368.156	941.565	9.600	3.049	0.000	441.731	6544.163	122444.741
123		0.072	11.415	1	169.105	952.980	11.290	4.061	0.000	457.082	6771.585	129216.326
127	19	0.074	11.661	1	172.758	964.641	6.796	0.031	0.000	463.909	6872.726	136089.052
130		0.064	10.428	1	154.496	975.069	5.997	3.977	0.000	473.883	7020.489	143109.541
134	20	0.117	16.962	1	251.282	992.031	5.500	4.017	0.000	483.400	7161.481	150271.022
137		0.045	8.086	1	119.799	1000.117	5.171	4.348	0.000	492.919	7302.504	157573.526
141	21	0.632	80.443	1	1191.749	1080.560	4.601	0.000	0.000	497.520	7370.667	164944.193
144		0.089	13.510	1	200.150	1094.071	3.715	4.399	0.000	505.634	7490.874	172435.067
Initial conc.			1198.300				20499.900	357.900	0.000	20857.800		

TKW-8

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	0.299	39.396	1	583.641	583.641	10.434	0.053	0.000	10.487	155.363	155.363
4		0.385	49.997	1	740.690	633.638	14.094	4.497	0.058	29.136	431.644	587.007
8	2	0.363	47.285	1	700.515	680.923	16.467	0.314	0.017	45.934	680.504	1267.511
11		0.347	45.313	1	671.297	726.235	16.089	0.031	0.020	62.074	919.615	2187.126
15	3	0.377	49.010	1	726.081	775.246	20.908	0.049	0.019	83.050	1230.370	3417.496
18		0.186	25.467	1	377.286	800.712	16.275	0.052	0.000	99.377	1472.252	4889.748
22	4	0.258	34.342	1	508.769	835.054	20.863	0.041	0.000	120.281	1781.941	6671.689
25		0.150	21.029	1	311.545	856.084	19.715	0.013	0.000	140.009	2074.207	8745.896
29	5	0.368	47.901	1	709.646	903.985	14.671	4.246	0.000	158.926	2354.459	11100.356
32		0.142	20.043	1	296.936	924.028	20.872	4.799	0.005	184.602	2734.844	13835.200
36	6	0.219	29.535	1	437.549	953.562	20.241	4.755	0.011	209.609	3105.311	16940.511
39		0.117	16.962	1	251.282	970.524	19.609	3.955	0.003	233.176	3454.452	20394.963
43	7	0.105	15.482	1	229.368	986.006	20.744	3.955	0.001	257.876	3820.378	24215.341
46		0.130	18.564	1	275.022	1004.570	17.406	3.407	0.004	278.693	4128.778	28344.119
50	8	0.169	23.371	1	346.242	1027.942	20.906	3.969	0.006	303.574	4497.385	32841.504
53		0.136	19.304	1	285.979	1047.245	13.031	3.656	0.006	320.267	4744.689	37586.193
57	9	0.252	33.602	1	497.812	1080.848	23.510	4.222	0.008	348.007	5155.652	42741.844
60		0.167	23.125	1	342.589	1103.972	22.257	4.235	0.013	374.512	5548.319	48290.163
64	10	0.213	28.795	1	426.592	1132.767	24.154	4.288	0.002	402.956	5969.711	54259.874
67		0.411	53.201	1	788.170	1185.969	22.488	4.155	0.004	429.603	6364.481	60624.356
71	11	0.513	65.775	1	974.437	1251.743	21.971	3.897	0.008	455.479	6747.830	67372.185
74		0.175	24.111	1	357.199	1275.854	21.369	3.919	0.007	480.774	7122.570	74494.756
78	12	0.165	22.878	1	338.937	1298.733	23.899	4.336	0.005	509.014	7540.941	82035.696
81		0.079	12.277	1	181.888	1311.010	21.132	3.752	0.006	533.904	7909.681	89945.378

TKW-8

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.064	10.428	1	154.496	1321.438	21.365	3.590	0.030	558.889	8279.830	98225.207
88		0.059	9.812	1	145.365	1331.251	20.934	3.391	0.008	583.222	8640.319	106865.526
92	14	0.140	19.797	1	293.283	1351.047	0.000	3.400	0.011	586.633	8690.852	115556.378
95		0.100	14.866	1	220.237	1365.913	20.960	3.110	0.006	610.709	9047.533	124603.911
99	15	0.190	25.960	1	384.591	1391.873	23.257	3.481	0.008	637.455	9443.770	134047.681
102		0.160	22.262	1	329.806	1414.135	22.218	3.253	0.013	662.939	9821.311	143868.993
106	16	0.180	24.727	1	366.329	1438.862	12.732	3.278	0.008	678.957	10058.615	153927.607
109		0.121	17.455	1	258.587	1456.317	22.519	2.903	0.003	704.382	10435.281	164362.889
113	17	0.210	28.425	1	421.114	1484.742	22.118	2.530	0.000	729.030	10800.437	175163.326
116		0.175	24.111	1	357.199	1508.853	23.232	2.590	0.000	754.851	11182.978	186346.304
120	18	0.135	19.180	1	284.153	1528.033	24.345	2.835	0.000	782.031	11585.644	197931.948
123		0.117	16.962	1	251.282	1544.995	23.944	0.936	0.000	806.911	11954.237	209886.185
127	19	0.148	20.783	1	307.893	1565.778	23.101	0.872	0.000	830.884	12309.393	222195.578
130		0.109	15.975	1	236.673	1581.753	25.800	0.808	0.000	857.492	12703.585	234899.163
134	20	0.195	26.576	1	393.722	1608.329	25.859	0.764	0.000	884.115	13098.000	247997.163
137		0.669	85.004	1	1259.317	1693.333	25.301	0.684	0.000	910.100	13482.963	261480.126
141	21	0.529	67.747	1	1003.656	1761.080	23.777	0.671	0.000	934.548	13845.156	275325.281
144		0.483	62.077	1	919.653	1823.156	22.740	0.511	0.000	957.799	14189.615	289514.896
Initial conc.			1198.300				20499.900	357.900	0.000	20857.800		

TKW-11

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	0.219	29.535	1	437.549	437.549	4.260	0.437	0.277	4.974	73.689	73.689
4		0.162	22.508	1	333.459	771.008	1.594	0.434	0.285	7.287	107.956	181.644
8	2	0.119	17.208	1	254.934	1025.942	1.034	0.447	0.285	9.043	133.970	315.615
11		0.150	21.029	1	311.545	1337.487	0.722	0.429	0.280	10.479	155.244	470.859
15	3	0.115	16.715	1	247.630	1585.117	0.027	0.454	0.285	11.238	166.489	637.348
18		0.131	18.687	1	276.848	1861.965	0.350	0.426	0.273	12.290	182.074	819.422
22	4	0.103	15.236	1	225.716	2087.681	0.144	0.454	0.288	13.176	195.200	1014.622
25		0.129	18.441	1	273.196	2360.877	0.053	0.457	0.286	13.941	206.533	1221.156
29	5	0.016	4.512	1	66.841	2427.717	0.194	0.450	0.296	13.941	206.533	1427.689
32		0.117	16.962	1	251.282	2678.999	0.101	0.439	0.287	14.786	219.052	1646.741
36	6	0.163	22.632	1	335.285	3014.284	0.362	11.542	0.029	15.627	231.511	1878.252
39		0.172	23.741	1	351.720	3366.004	0.396	15.546	0.091	16.553	245.230	2123.481
43	7	0.122	17.578	1	260.413	3626.417	0.374	14.137	0.077	28.546	422.904	2546.385
46		0.134	19.057	1	282.327	3908.744	0.271	11.504	0.080	44.443	658.415	3204.800
50	8	0.241	32.246	1	477.725	4386.468	0.366	15.977	0.138	59.084	875.319	4080.119
53		0.098	14.619	1	216.585	4603.053	0.356	17.249	0.191	71.134	1053.837	5133.956
57	9	0.129	18.441	1	273.196	4876.249	0.345	18.520	0.243	87.699	1299.244	6433.200
60		0.130	18.564	1	275.022	5151.271	0.368	20.069	0.253	105.569	1563.978	7997.178
64	10	0.174	23.988	1	355.373	5506.644	0.325	16.675	0.183	124.597	1845.874	9843.052
67		0.055	9.319	1	138.061	5644.704	0.387	15.543	0.086	145.139	2150.200	11993.252
71	11	0.060	9.935	1	147.191	5791.896	0.367	16.347	0.143	162.324	2404.793	14398.044
74		0.115	16.715	1	247.630	6039.525	0.340	14.822	0.128	178.335	2641.993	17040.037
78	12	0.091	13.757	1	203.802	6243.327	0.381	15.435	0.118	195.181	2891.563	19931.600
81		0.072	11.415	1	169.105	6412.433	0.360	15.116	0.137	210.500	3118.511	23050.111

TKW-11

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.125	17.948	1	265.891	6678.324	0.417	14.423	0.088	226.440	3354.659	26404.770
88		0.053	9.073	1	134.408	6812.732	0.068	3.590	0.033	241.657	3580.096	29984.867
92	14	0.041	7.593	1	112.495	6925.227	0.346	13.491	0.133	256.559	3800.867	33785.733
95		0.051	8.826	1	130.756	7055.983	13.839	12.645	0.157	274.145	4061.400	37847.133
99	15	0.052	8.949	1	132.582	7188.565	11.611	12.504	0.126	299.373	4435.148	42282.281
102		0.089	13.510	1	200.150	7388.715	11.293	11.572	0.109	323.420	4791.400	47073.681
106	16	0.061	10.059	1	149.018	7537.732	11.625	10.310	0.083	347.632	5150.096	52223.778
109		0.052	8.949	1	132.582	7670.315	13.192	2.563	0.009	372.405	5517.104	57740.881
113	17	0.146	20.536	1	304.240	7974.555	12.289	10.048	0.062	395.066	5852.822	63593.704
116		0.111	16.222	1	240.325	8214.880	11.903	9.271	0.054	409.586	6067.933	69661.637
120	18	0.103	15.236	1	225.716	8440.596	11.481	10.442	0.101	431.216	6388.378	76050.015
123		0.148	20.783	1	307.893	8748.488	13.903	16.534	0.264	454.654	6735.607	82785.622
127	19	0.142	20.043	1	296.936	9045.424	13.244	12.955	0.153	478.493	7088.778	89874.400
130		0.113	16.468	1	243.977	9289.401	12.525	3.023	0.000	507.552	7519.281	97393.681
134	20	0.540	69.103	1	1023.743	10313.145	13.996	3.953	0.018	534.521	7918.822	105312.504
137		0.139	19.673	1	291.457	10604.602	13.781	4.173	0.039	551.364	8168.348	113480.852
141	21	0.180	24.727	1	366.329	10970.932	12.914	3.779	0.019	568.250	8418.511	121899.363
144		1.115	139.980	1	2073.780	13044.712	15.745	5.877	0.078	588.246	8714.748	130614.111
Initial conc.			1198.300				20499.900	357.900	0.000	20857.800		

TKW-14

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	0.469	60.351	1	894.087	894.087	10.829	3.085	0.060	13.974	207.022	207.022
4		0.187	25.590	1	379.112	919.677	10.067	2.510	0.051	26.602	394.104	601.126
8	2	0.486	62.446	1	925.131	982.123	18.390	5.604	0.061	50.657	750.474	1351.600
11		0.100	14.866	1	220.237	996.989	14.396	3.875	0.054	68.982	1021.956	2373.556
15	3	0.193	26.330	1	390.069	1023.319	16.260	0.011	0.047	85.300	1263.704	3637.259
18		0.242	32.370	1	479.551	1055.689	18.124	3.992	0.050	107.466	1592.089	5229.348
22	4	0.218	29.411	1	435.723	1085.100	20.906	4.581	0.055	133.008	1970.489	7199.837
25		0.153	21.399	1	317.023	1106.499	19.317	4.647	0.062	157.034	2326.430	9526.267
29	5	0.250	33.356	1	494.160	1139.855	18.033	3.845	0.053	178.965	2651.333	12177.600
32		0.118	17.085	1	253.108	1156.940	17.872	3.827	0.055	200.719	2973.615	15151.215
36	6	0.242	32.370	1	479.551	1189.309	19.068	4.203	0.056	224.046	3319.200	18470.415
39		0.172	23.741	1	351.720	1213.050	19.452	3.897	0.054	247.449	3665.911	22136.326
43	7	0.232	31.137	1	461.289	1244.187	0.117	3.910	0.055	251.531	3726.385	25862.711
46		0.700	88.825	1	1315.928	1333.013	18.661	3.528	0.055	273.775	4055.926	29918.637
50	8	0.215	29.042	1	430.245	1362.054	23.576	4.103	0.053	301.507	4466.770	34385.407
53		0.109	15.975	1	236.673	1378.030	20.938	3.496	0.053	325.994	4829.541	39214.948
57	9	0.267	35.451	1	525.204	1413.481	25.637	3.958	0.054	355.643	5268.785	44483.733
60		0.186	25.467	1	377.286	1438.948	22.236	3.454	0.056	381.389	5650.207	50133.941
64	10	0.171	23.618	1	349.894	1462.565	24.122	3.269	0.052	408.832	6056.770	56190.711
67		0.115	16.715	1	247.630	1479.280	22.037	3.033	0.052	433.954	6428.948	62619.659
71	11	0.108	15.852	1	234.847	1495.133	0.000	3.652	0.054	437.660	6483.852	69103.511
74		0.062	10.182	1	150.844	1505.315	13.380	3.105	0.056	454.201	6728.904	75832.415
78	12	0.380	49.380	1	731.559	1554.695	22.235	3.245	0.054	479.735	7107.182	82939.597
81		0.084	12.894	1	191.019	1567.589	19.005	1.905	0.125	500.770	7418.812	90358.409

TKW-14

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.042	7.717	1	114.321	1575.305	18.807	2.773	0.056	522.406	7739.345	98097.754
88		0.172	23.741	1	351.720	1599.046	18.895	2.592	0.054	543.947	8058.471	106156.225
92	14	0.212	28.672	1	424.766	1627.718	22.099	2.574	0.057	568.677	8424.841	114581.067
95		0.577	73.663	1	1091.311	1701.382	19.714	2.586	0.071	591.048	8756.264	123337.330
99	15	0.066	10.675	1	158.148	1712.057	21.399	2.556	0.061	615.064	9112.056	132449.387
102		0.058	9.689	1	143.539	1721.746	19.441	2.536	0.053	637.094	9438.427	141887.813
106	16	0.083	12.771	1	189.193	1734.516	19.951	2.229	0.052	659.326	9767.790	151655.603
109		0.059	9.812	1	145.365	1744.328	18.568	1.365	0.021	679.279	10063.397	161719.000
113	17	0.132	18.811	1	278.674	1763.139	17.184	1.397	0.020	697.880	10338.967	172057.967
116		0.195	26.576	1	393.722	1789.715	19.514	1.672	0.031	719.097	10653.293	182711.261
120	18	0.148	20.783	1	307.893	1810.498	22.701	2.146	0.051	743.995	11022.153	193733.413
123		0.659	83.771	1	1241.055	1894.269	21.165	1.667	0.024	766.851	11360.760	205094.173
127	19	0.128	18.317	1	271.370	1912.586	21.643	2.054	0.054	790.602	11712.627	216806.800
130		0.179	24.604	1	364.503	1937.190	20.285	1.747	0.052	812.686	12039.797	228846.597
134	20	0.139	19.673	1	291.457	1956.864	21.482	1.955	0.053	836.176	12387.797	241234.394
137		0.132	18.811	1	278.674	1975.674	20.712	1.752	0.052	858.692	12721.367	253955.761
141	21	0.141	19.920	1	295.110	1995.594	21.438	1.773	0.051	881.954	13065.990	267021.751
144		0.146	20.536	1	304.240	2016.130	20.263	1.887	0.054	904.158	13394.938	280416.689
Initial conc.			1198.300				20499.900	357.900	0.000	20857.800		

TKW-15

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	2.191	272.613	1	4038.717	4038.717	0.065	26.206	0.038	26.309	389.763	389.763
4		0.628	79.950	1	1184.445	4118.667	26.847	7.731	0.034	60.921	902.533	1292.296
8	2	0.524	67.130	1	994.525	4185.798	22.675	8.712	0.031	92.339	1367.985	2660.281
11		0.400	51.846	1	768.082	4237.643	15.911	6.366	0.032	114.648	1698.489	4358.770
15	3	0.746	94.495	1	1399.930	4332.139	18.160	7.241	0.031	140.080	2075.259	6434.030
18		0.462	59.488	1	881.304	4391.627	12.733	4.529	0.030	157.372	2331.437	8765.467
22	4	0.496	63.679	1	943.393	4455.306	15.810	8.101	0.033	181.316	2686.163	11451.630
25		0.425	54.927	1	813.736	4510.233	10.564	7.337	0.035	199.252	2951.881	14403.511
29	5	0.472	60.721	1	899.565	4570.954	12.268	4.325	0.032	215.877	3198.178	17601.689
32		0.346	45.189	1	669.470	4616.143	8.388	3.477	0.032	227.774	3374.430	20976.119
36	6	0.480	61.707	1	914.174	4677.850	9.568	4.115	0.033	241.490	3577.630	24553.748
39		0.351	45.806	1	678.601	4723.655	8.491	3.232	0.032	253.245	3751.778	28305.526
43	7	0.547	69.966	1	1036.527	4793.621	6.771	3.452	0.031	263.499	3903.689	32209.215
46		0.318	41.738	1	618.338	4835.359	8.194	2.392	0.031	274.116	4060.978	36270.193
50	8	0.497	63.802	1	945.219	4899.161	0.000	3.657	0.033	277.806	4115.644	40385.837
53		0.318	41.738	1	618.338	4940.899	5.709	2.688	0.032	286.235	4240.519	44626.356
57	9	0.749	94.865	1	1405.409	5035.764	5.183	3.513	0.033	294.964	4369.837	48996.193
60		0.581	74.157	1	1098.616	5109.920	7.433	2.785	0.033	305.215	4521.704	53517.896
64	10	0.372	48.394	1	716.950	5158.314	6.130	3.210	0.032	314.587	4660.548	58178.444
67		0.496	63.679	1	943.393	5221.993	4.637	2.548	0.033	321.805	4767.481	62945.926
71	11	0.459	59.118	1	875.825	5281.112	4.339	2.380	0.032	328.556	4867.496	67813.422
74		0.317	41.615	1	616.512	5322.726	3.055	1.838	0.031	333.480	4940.444	72753.867
78	12	0.574	73.294	1	1085.833	5396.020	0.000	0.211	0.033	333.724	4944.059	77697.926
81		0.353	46.052	1	682.253	5442.072	2.490	1.671	0.032	337.917	5006.178	82704.104

TKW-15

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.252	33.602	1	497.812	5475.674	2.274	1.658	0.032	341.881	5064.904	87769.007
88		0.265	35.205	1	521.552	5510.879	2.220	1.953	0.035	346.089	5127.244	92896.252
92	14	0.413	53.448	1	791.822	5564.327	2.368	1.755	0.032	350.244	5188.800	98085.052
95		0.337	44.080	1	653.035	5608.407	1.719	1.591	0.033	353.587	5238.326	103323.378
99	15	0.273	36.191	1	536.161	5644.598	2.058	2.059	0.033	357.737	5299.807	108623.185
102		0.214	28.918	1	428.419	5673.516	1.517	1.666	0.033	360.953	5347.452	113970.637
106	16	0.362	47.161	1	698.689	5720.678	31.657	1.652	0.032	394.294	5841.393	119812.030
109		0.332	43.464	1	643.904	5764.141	27.867	1.424	0.033	423.618	6275.822	126087.852
113	17	0.422	54.557	1	808.258	5818.699	36.210	1.688	0.024	461.540	6837.630	132925.481
116		0.359	46.792	1	693.210	5865.490	26.341	1.291	0.022	489.194	7247.319	140172.800
120	18	0.648	82.415	1	1220.968	5947.906	34.294	1.772	0.033	525.293	7782.119	147954.919
123		0.370	48.148	1	713.298	5996.053	37.981	1.516	0.034	564.824	8367.763	156322.681
127	19	0.465	59.858	1	886.782	6055.911	43.799	1.701	0.035	610.359	9042.356	165365.037
130		0.387	50.243	1	744.343	6106.154	31.075	1.551	0.034	643.019	9526.207	174891.244
134	20	0.583	74.403	1	1102.268	6180.557	37.185	2.312	0.037	682.553	10111.896	185003.141
137		0.856	108.054	1	1600.807	6288.612	30.540	1.632	0.038	714.763	10589.081	195592.222
141	21	0.473	60.844	1	901.391	6349.456	37.162	1.604	0.034	753.563	11163.896	206756.119
144		0.391	50.736	1	751.647	6400.192	29.206	1.647	0.035	784.451	11621.496	218377.615
Initial conc.			1198.300				20499.900	357.900	0.000	20857.800		

TKW-18

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	0.096	14.373	1	212.933	212.933	40.525	4.604	0.040	45.169	669.170	669.170
4		0.089	13.510	1	200.150	226.443	23.705	3.556	0.037	72.467	1073.585	1742.756
8	2	0.106	15.606	1	231.194	242.049	17.925	2.729	0.028	93.149	1379.985	3122.741
11		0.095	14.250	1	211.107	256.298	20.416	3.755	0.028	117.348	1738.489	4861.230
15	3	0.098	14.619	1	216.585	270.918	20.384	3.788	0.028	141.548	2097.007	6958.237
18		0.117	16.962	1	251.282	287.879	19.915	3.765	0.028	165.256	2448.237	9406.474
22	4	0.118	17.085	1	253.108	304.964	20.581	3.842	0.028	189.707	2810.474	12216.948
25		0.116	16.838	1	249.456	321.802	19.998	3.648	0.028	213.381	3161.200	15378.148
29	5	0.044	7.963	1	117.973	329.766	18.804	3.230	0.028	235.443	3488.044	18866.193
32		0.093	14.003	1	207.454	343.769	0.000	3.490	0.028	238.961	3540.163	22406.356
36	6	0.139	19.673	1	291.457	363.442	19.074	3.022	0.048	261.105	3868.222	26274.578
39		0.092	13.880	1	205.628	377.322	19.792	2.979	0.047	283.923	4206.267	30480.844
43	7	0.074	11.661	1	172.758	388.983	19.478	2.801	0.046	306.248	4537.007	35017.852
46		0.179	24.604	1	364.503	413.587	18.904	2.817	0.052	328.021	4859.570	39877.422
50	8	0.106	15.606	1	231.194	429.193	18.929	2.546	0.047	349.543	5178.415	45055.837
53		0.090	13.633	1	201.976	442.826	19.482	2.612	0.047	371.684	5506.430	50562.267
57	9	0.128	18.317	1	271.370	461.143	17.786	2.354	0.047	391.871	5805.496	56367.763
60		0.041	7.593	1	112.495	468.737	16.387	2.309	0.047	410.614	6083.170	62450.933
64	10	0.071	11.291	1	167.279	480.028	19.469	4.324	0.047	434.454	6436.356	68887.289
67		0.076	11.908	1	176.410	491.936	18.930	4.821	0.048	458.253	6788.933	75676.222
71	11	0.079	12.277	1	181.888	504.213	18.539	3.794	0.049	480.635	7120.519	82796.741
74		0.077	12.031	1	178.236	516.244	19.270	3.854	0.048	503.807	7463.807	90260.548
78	12	0.039	7.347	1	108.842	523.591	0.000	4.041	0.048	507.896	7524.385	97784.933
81		0.066	10.675	1	158.148	534.266	18.584	3.508	0.048	530.036	7852.385	105637.319

TKW-18

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.078	12.154	1	180.062	546.420	20.579	3.772	0.047	554.434	8213.837	113851.156
88		0.062	10.182	1	150.844	556.602	16.554	3.409	0.052	574.449	8510.356	122361.511
92	14	0.045	8.086	1	119.799	564.689	12.998	2.909	0.048	590.404	8746.726	131108.237
95		0.047	8.333	1	123.451	573.022	19.012	3.422	0.048	612.886	9079.793	140188.030
99	15	0.057	9.566	1	141.713	582.587	18.998	3.298	0.048	635.230	9410.815	149598.844
102		0.059	9.812	1	145.365	592.399	18.630	3.223	0.049	657.132	9735.289	159334.133
106	16	0.051	8.826	1	130.756	601.226	19.061	3.268	0.047	679.508	10066.785	169400.919
109		0.450	58.009	1	859.390	659.234	19.058	3.048	0.047	701.661	10394.978	179795.896
113	17	0.754	95.481	1	1414.540	754.716	20.028	2.091	0.017	723.797	10722.919	190518.815
116		0.095	14.250	1	211.107	768.965	19.602	2.038	0.020	745.457	11043.807	201562.622
120	18	0.094	14.126	1	209.281	783.092	19.567	2.948	0.048	768.020	11378.074	212940.696
123		0.162	22.508	1	333.459	805.600	19.572	2.914	0.048	790.554	11711.911	224652.607
127	19	0.102	15.113	1	223.890	820.713	19.969	2.931	0.047	813.501	12051.867	236704.474
130		0.119	17.208	1	254.934	837.921	19.147	2.580	0.048	835.276	12374.459	249078.933
134	20	0.114	16.592	1	245.804	854.513	20.302	3.055	0.047	858.680	12721.185	261800.119
137		0.106	15.606	1	231.194	870.118	18.922	3.281	0.047	880.930	13050.815	274850.933
141	21	0.089	13.510	1	200.150	883.628	20.723	3.063	0.047	904.763	13403.896	288254.830
144		0.119	17.208	1	254.934	900.836	20.990	2.790	0.049	928.592	13756.919	302011.748
Initial conc.						1198.300	20499.900	357.900	0.000	20857.800		

TKW-19

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	0.762	96.468	1	1429.149	1429.149	4.349	51.401	0.223	55.973	829.230	829.230
4		0.213	28.795	1	426.592	1457.944	33.836	23.151	0.175	113.135	1676.074	2505.304
8	2	0.027	5.868	1	86.928	1463.811	17.354	48.451	0.207	179.147	2654.030	5159.333
11		0.462	59.488	1	881.304	1523.299	24.946	38.344	0.108	242.545	3593.259	8752.593
15	3	0.423	54.681	1	810.084	1577.980	27.912	47.850	0.069	318.376	4716.674	13469.267
18		0.346	45.189	1	669.470	1623.169	30.877	43.969	0.149	393.371	5827.711	19296.978
22	4	0.364	47.408	1	702.341	1670.577	30.252	48.059	0.115	471.797	6989.578	26286.556
25		0.333	43.587	1	645.730	1714.164	29.305	46.577	0.202	547.881	8116.748	34403.304
29	5	0.171	23.618	1	349.894	1737.782	3.893	43.374	0.102	595.250	8818.511	43221.815
32		0.258	34.342	1	508.769	1772.124	29.941	39.993	0.099	665.283	9856.037	53077.852
36	6	0.272	36.068	1	534.335	1808.192	3.584	45.204	0.103	714.174	10580.348	63658.200
39		0.203	27.562	1	408.331	1835.754	27.490	37.987	0.084	779.735	11551.622	75209.822
43	7	0.247	32.986	1	488.681	1868.740	30.756	40.499	0.085	851.075	12608.511	87818.333
46		0.179	24.604	1	364.503	1893.344	26.124	34.971	0.089	912.259	13514.941	101333.274
50	8	0.185	25.344	1	375.460	1918.687	28.899	36.366	0.085	977.609	14483.089	115816.363
53		0.111	16.222	1	240.325	1934.909	26.238	34.572	0.117	1038.536	15385.711	131202.074
57	9	0.212	28.672	1	424.766	1963.581	29.573	38.976	0.112	1107.197	16402.911	147604.985
60		0.513	65.775	1	974.437	2029.356	26.579	34.959	0.092	1168.827	17315.948	164920.933
64	10	0.221	29.781	1	441.202	2059.137	31.128	37.103	0.087	1237.145	18328.067	183249.000
67		0.102	15.113	1	223.890	2074.249	27.382	34.075	0.075	1298.677	19239.652	202488.652
71	11	0.870	109.780	1	212.933	2088.622	30.662	36.470	0.103	1365.912	20235.726	222724.378
74		0.090	13.633	1	201.976	2102.256	29.699	30.696	0.085	1426.392	21131.726	243856.104
78	12	0.178	24.481	1	362.677	2126.736	32.137	33.533	0.087	1492.149	22105.904	265962.007
81		0.098	14.619	1	216.585	2141.356	1.382	33.320	0.083	1526.934	22621.237	288583.244

TKW-19

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.101	14.989	1	222.064	2156.345	21.300	35.313	0.083	1583.630	23461.178	312044.422
88		0.108	15.852	1	234.847	2172.197	35.515	30.023	0.143	1649.311	24434.230	336478.652
92	14	0.069	11.045	1	163.627	2183.242	27.873	26.736	0.100	1704.020	25244.733	361723.385
95		0.081	12.524	1	185.541	2195.766	25.930	26.157	0.030	1756.137	26016.837	387740.222
99	15	0.107	15.729	1	233.020	2211.495	26.314	28.718	0.106	1811.275	26833.696	414573.919
102		0.079	12.277	1	181.888	2223.772	26.902	25.117	0.083	1863.377	27605.578	442179.496
106	16	0.067	10.798	1	159.974	2234.571	0.662	27.700	0.101	1891.840	28027.252	470206.748
109		0.055	9.319	1	138.061	2243.890	4.107	25.736	0.144	1921.826	28471.496	498678.244
113	17	0.162	22.508	1	333.459	2266.398	7.551	2.909	0.025	1932.311	28626.830	527305.074
116		0.127	18.194	1	269.543	2284.592	50.432	2.790	0.027	1985.560	29415.704	556720.778
120	18	0.152	21.276	1	315.197	2305.868	40.037	26.041	0.094	2051.732	30396.022	587116.800
123		0.113	16.468	1	243.977	2322.337	29.641	26.041	0.092	2107.506	31222.304	618339.104
127	19	0.106	15.606	1	231.194	2337.942	28.229	24.808	0.092	2160.634	32009.393	650348.496
130		0.107	15.729	1	233.020	2353.671	41.037	23.574	0.092	2225.337	32967.956	683316.452
134	20	0.120	17.331	1	256.760	2371.003	30.106	25.689	0.102	2281.234	33796.059	717112.511
137		0.103	15.236	1	225.716	2386.238	28.972	24.118	0.097	2334.421	34584.015	751696.526
141	21	0.116	16.838	1	249.456	2403.077	25.120	23.393	0.093	2383.027	35304.104	787000.630
144		0.102	15.113	1	223.890	2418.189	208.884	0.091	0.086	2592.088	38401.304	825401.933
Initial conc.						1198.300	20499.900	357.900	0.000	20857.800		

TKW-22

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	0.793	100.289	10	14857.595	14857.595	0.975	1.313	1.120	3.408	50.489	50.489
4		0.687	87.223	10	12921.876	15729.821	8.485	7.967	2.131	21.991	325.793	376.281
8	2	0.204	27.686	10	13999.304	16674.774	7.350	11.294	2.474	43.109	638.652	1014.933
11		0.805	101.768	10	15076.733	17692.454	3.438	14.621	1.346	62.514	926.133	1941.067
15	3	0.551	70.459	10	10438.311	18397.040	1.551	34.264	0.934	99.263	1470.563	3411.630
18		0.430	55.544	10	8228.670	18952.475	0.289	21.908	0.683	122.143	1809.526	5221.156
22	4	0.340	44.450	10	6585.135	19396.972	0.206	10.795	0.310	133.454	1977.096	7198.252
25		0.181	24.851	10	3681.556	19645.477	0.079	3.142	0.000	136.675	2024.815	9223.067
29	5	0.180	24.727	10	3663.294	19892.749	0.049	1.492	0.000	138.216	2047.644	11270.711
32		0.147	20.659	10	3060.665	20099.344	0.036	1.001	0.000	139.253	2063.007	13333.719
36	6	0.176	24.234	10	3590.248	20341.686	0.023	0.000	0.000	139.276	2063.348	15397.067
39		0.321	42.108	1	623.817	20383.793	0.034	0.743	0.000	140.053	2074.859	17471.926
43	7	0.362	47.161	1	698.689	20430.955	0.035	1.028	0.000	141.116	2090.607	19562.533
46		0.890	112.245	1	1662.896	20543.200	0.036	2.054	0.238	143.444	2125.096	21687.630
50	8	0.187	25.590	1	379.112	20568.790	0.024	1.516	0.044	145.028	2148.563	23836.193
53		0.130	18.564	1	275.022	20587.354	0.034	1.104	0.005	146.171	2165.496	26001.689
57	9	0.381	49.504	1	733.386	20636.858	0.205	1.684	0.121	148.181	2195.274	28196.963
60		0.447	57.639	1	853.912	20694.497	0.031	1.886	0.187	150.285	2226.444	30423.407
64	10	0.480	61.707	1	914.174	20756.204	0.032	1.709	0.155	152.181	2254.533	32677.941
67		0.241	32.246	1	477.725	20788.450	0.045	1.365	0.027	153.618	2275.822	34953.763
71	11	0.497	63.802	1	945.219	20852.252	0.028	2.004	0.113	155.763	2307.600	37261.363
74		0.362	47.161	1	698.689	20899.414	0.033	1.459	0.084	157.339	2330.948	39592.311
78	12	0.218	29.411	1	435.723	20928.825	0.017	1.367	0.002	158.725	2351.481	41943.793
81		0.154	21.522	1	318.850	20950.348	0.028	1.164	0.025	159.942	2369.511	44313.304

TKW-22

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.239	32.000	1	474.072	20982.347	0.030	1.236	0.000	161.208	2388.267	46701.570
88		0.137	19.427	1	287.805	21001.774	0.032	0.997	0.000	162.237	2403.511	49105.081
92	14	0.119	17.208	1	254.934	21018.982	0.126	1.119	0.000	163.482	2421.956	51527.037
95		0.094	14.126	1	209.281	21033.109	0.263	0.662	0.000	164.407	2435.659	53962.696
99	15	0.083	12.771	1	189.193	21045.879	0.655	1.365	0.000	166.427	2465.585	56428.281
102		0.134	19.057	1	282.327	21064.936	1.009	0.963	0.000	168.399	2494.800	58923.081
106	16	0.104	15.359	1	227.542	21080.295	0.803	1.032	0.000	170.234	2521.985	61445.067
109		0.149	20.906	1	309.719	21101.201	0.984	0.217	0.055	171.490	2540.593	63985.659
113	17	0.205	2.540	1	37.622	21103.741	0.756	0.981	0.000	173.227	2566.326	66551.985
116		0.260	34.588	1	512.421	21138.329	0.758	1.046	0.000	175.031	2593.052	69145.037
120	18	0.234	31.384	1	464.942	21169.713	0.833	0.975	0.000	176.839	2619.837	71764.874
123		0.269	35.698	1	528.857	21205.411	0.611	1.139	0.000	178.589	2645.763	74410.637
127	19	0.238	31.877	1	472.246	21237.287	0.644	0.841	0.000	180.074	2667.763	77078.400
130		0.275	36.437	1	539.814	21273.725	0.971	0.949	0.000	181.994	2696.207	79774.607
134	20	0.410	53.078	1	786.344	21326.803	0.516	1.744	0.105	184.359	2731.244	82505.852
137		0.210	28.425	1	421.114	21355.228	0.417	0.708	0.000	185.484	2747.911	85253.763
141	21	0.279	36.930	1	547.118	21392.159	0.427	0.533	0.000	186.444	2762.133	88015.896
144		0.249	33.233	1	492.334	21425.391	0.427	0.541	0.000	187.412	2776.474	90792.370
Initial conc.						1198.300	20499.900	357.900	0.000	20857.800		

TKW-23

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	0.599	100.289	50	1131.486	1131.486	45.260	0.083	0.000	45.343	671.748	671.748
4		0.267	87.223	50	525.204	1166.938	49.169	43.457	35.638	173.607	2571.948	3243.696
8	2	0.185	27.686	50	375.460	1192.281	51.123	12.230	10.237	247.196	3662.167	6905.863
11		0.196	101.768	50	395.548	1218.981	53.077	1.712	1.221	303.206	4491.944	11397.807
15	3	0.146	70.459	50	304.240	1239.517	13.349	1.727	0.791	319.073	4727.011	16124.819
18		0.153	55.544	50	317.023	1260.916	6.675	0.979	0.969	327.696	4854.759	20979.578
22	4	0.327	44.450	10	634.774	1303.763	3.652	0.941	0.321	332.610	4927.559	25907.137
25		0.282	24.851	10	552.597	1341.063	3.040	0.761	0.258	336.669	4987.693	30894.830
29	5	0.223	24.727	10	444.854	1371.091	4.278	0.901	0.276	342.124	5068.507	35963.337
32		0.220	20.659	10	439.375	1400.749	2.516	0.617	0.215	345.472	5118.107	41081.444
36	6	0.240	24.234	10	475.898	1432.872	1.333	1.384	0.461	348.650	5165.189	46246.633
39		0.195	42.108	10	393.722	1459.448	1.847	0.277	0.285	351.059	5200.878	51447.511
43	7	0.184	47.161	10	373.634	1484.669	2.173	1.168	0.348	354.748	5255.530	56703.041
46		0.220	112.245	10	439.375	1514.326	1.321	0.623	0.192	356.884	5287.174	61990.215
50	8	0.198	25.590	10	399.200	1541.272	1.866	0.984	0.289	360.023	5333.678	67323.893
53		0.195	18.564	10	393.722	1567.849	1.499	0.742	0.209	362.473	5369.974	72693.867
57	9	0.211	49.504	10	422.940	1596.397	1.970	1.089	0.271	365.803	5419.307	78113.174
60		0.184	57.639	10	373.634	1621.617	1.505	0.753	0.222	368.283	5456.048	83569.222
64	10	0.160	61.707	10	329.806	1643.879	0.808	1.035	0.247	370.373	5487.011	89056.233
67		0.163	32.246	10	335.285	1666.511	0.910	0.554	0.150	371.987	5510.922	94567.156
71	11	0.759	63.802	1	1423.670	1762.609	0.643	1.090	0.255	373.975	5540.374	100107.530
74		0.651	47.161	1	1226.446	1845.394	0.663	0.745	0.188	375.571	5564.019	105671.548
78	12	0.398	29.411	1	764.430	1896.993	0.408	0.964	0.220	377.163	5587.604	111259.152
81		0.408	21.522	1	782.692	1949.825	0.400	0.297	0.078	377.938	5599.085	116858.237

TKW-23

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.183	32.000	1	371.808	1974.922	0.473	0.009	0.073	378.493	5607.307	122465.544
88		0.627	19.427	1	1182.619	2054.748	0.280	0.554	0.089	379.416	5620.981	128086.526
92	14	0.586	17.208	1	1107.746	2129.521	0.213	0.232	0.067	379.928	5628.567	133715.093
95		0.563	14.126	1	1065.745	2201.459	0.245	0.362	0.093	380.628	5638.930	139354.022
99	15	0.538	12.771	1	1020.091	2270.315	0.276	0.384	0.098	381.386	5650.159	145004.181
102		0.506	19.057	1	961.654	2335.227	0.146	0.302	0.081	381.915	5657.996	150662.178
106	16	0.714	15.359	1	1341.494	2425.778	0.147	0.313	0.082	382.457	5666.026	156328.204
109		0.579	20.906	1	37.622	2428.317	0.129	0.240	0.067	382.893	5672.485	162000.689
113	17	0.443	2.540	1	846.607	2485.463	0.118	0.310	0.086	383.407	5680.100	167680.789
116		0.435	34.588	1	831.998	2541.623	0.095	0.232	0.070	383.804	5685.981	173366.770
120	18	0.429	31.384	1	37.622	2544.163	0.066	0.321	0.080	384.271	5692.900	179059.670
123		0.423	35.698	1	810.084	2598.843	0.049	0.206	0.061	384.587	5697.581	184757.252
127	19	0.604	31.877	1	1140.617	2675.835	0.050	0.314	0.074	385.025	5704.070	190461.322
130		0.448	36.437	1	855.738	2733.597	0.036	0.228	0.062	385.351	5708.900	196170.222
134	20	0.374	53.078	1	720.603	2782.238	0.023	0.358	0.081	385.813	5715.744	201885.967
137		0.421	28.425	1	806.432	2836.672	0.044	0.243	0.065	386.165	5720.959	207606.926
141	21	0.397	36.930	1	762.604	2888.148	0.000	0.364	0.074	386.603	5727.448	213334.374
144		0.367	33.233	1	707.820	2935.926	0.000	0.304	0.071	386.978	5733.004	219067.378
Initial conc.						1198.300	20499.900	357.900	0.000	20857.800		

TKW-25

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	0.220	29.658	1	439.375	439.375	9.813	7.534	0.123	17.470	258.815	258.815
4		0.330	43.217	1	640.252	482.592	10.816	4.000	0.000	32.286	478.311	737.126
8	2	0.547	69.966	1	1036.527	552.558	9.957	3.634	0.000	45.877	679.659	1416.785
11		0.159	22.139	1	327.980	574.697	10.813	3.315	0.000	60.005	888.963	2305.748
15	3	0.279	36.930	1	547.118	611.627	11.230	3.464	0.000	74.699	1106.652	3412.400
18		0.146	20.536	1	304.240	632.163	10.520	3.292	0.000	88.511	1311.274	4723.674
22	4	0.105	15.482	1	229.368	647.646	11.345	3.614	0.000	103.470	1532.889	6256.563
25		0.129	18.441	1	273.196	666.086	12.070	3.464	0.000	119.004	1763.022	8019.585
29	5	0.130	18.564	1	275.022	684.650	11.862	3.150	0.000	134.016	1985.422	10005.007
32		0.160	22.262	1	329.806	706.912	11.644	3.937	0.000	149.597	2216.252	12221.259
36	6	0.129	18.441	1	273.196	725.353	12.785	4.227	0.000	166.609	2468.281	14689.541
39		0.076	11.908	1	176.410	737.261	13.683	4.000	0.000	184.292	2730.252	17419.793
43	7	0.154	21.522	1	318.850	758.783	13.694	4.008	0.000	201.994	2992.504	20412.296
46		0.135	19.180	1	284.153	777.963	15.198	3.803	0.000	220.995	3274.000	23686.296
50	8	0.117	16.962	1	251.282	794.925	12.814	3.987	0.000	237.796	3522.904	27209.200
53		0.154	21.522	1	318.850	816.447	13.467	4.567	0.000	255.830	3790.074	30999.274
57	9	0.094	14.126	1	209.281	830.574	14.793	3.391	0.000	274.014	4059.467	35058.741
60		0.228	30.644	1	453.985	861.218	13.127	3.918	0.000	291.059	4311.985	39370.726
64	10	0.098	14.619	1	216.585	875.837	13.628	3.949	0.000	308.636	4572.385	43943.111
67		0.119	17.208	1	254.934	893.045	13.311	4.008	0.025	325.980	4829.333	48772.444
71	11	0.114	16.592	1	245.804	909.637	14.955	4.365	0.030	345.330	5116.000	53888.444
74		0.126	18.071	1	267.717	927.708	15.172	3.978	0.027	364.507	5400.104	59288.548
78	12	0.033	6.607	1	97.885	934.315	17.209	4.022	0.018	385.756	5714.904	65003.452
81		0.059	9.812	1	145.365	944.127	17.526	3.919	0.018	407.219	6032.874	71036.326

TKW-25

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.078	12.154	1	180.062	956.281	16.040	3.402	0.014	426.675	6321.111	77357.437
88		0.059	9.812	1	145.365	966.094	14.733	3.034	0.018	444.460	6584.593	83942.030
92	14	0.071	11.291	1	167.279	977.385	16.954	3.677	0.031	465.122	6890.696	90832.726
95		0.083	12.771	1	189.193	990.155	17.107	3.171	0.016	485.416	7191.348	98024.074
99	15	0.077	12.031	1	178.236	1002.186	17.070	3.658	0.038	506.182	7498.993	105523.067
102		0.010	3.772	1	55.884	1005.959	18.032	2.726	0.016	526.956	7806.756	113329.822
106	16	0.062	10.182	1	150.844	1016.141	20.028	2.981	0.022	549.987	8147.956	121477.778
109		0.051	8.826	1	130.756	1024.967	14.944	2.115	0.015	567.061	8400.904	129878.681
113	17	0.050	8.703	1	128.930	1033.669	20.298	2.755	0.013	590.127	8742.622	138621.304
116		0.074	2.540	1	37.622	1036.209	21.620	2.893	0.014	614.654	9105.985	147727.289
120	18	0.098	14.619	1	216.585	1050.828	41.661	2.667	0.011	658.993	9762.859	157490.148
123		0.120	17.331	1	256.760	1068.160	13.211	1.584	0.014	673.802	9982.252	167472.400
127	19	0.115	16.715	1	247.630	1084.875	19.253	2.657	0.023	695.735	10307.185	177779.585
130		0.141	19.920	1	295.110	1104.795	15.865	1.275	0.013	712.888	10561.304	188340.889
134	20	0.120	17.331	1	256.760	1122.126	18.173	2.527	0.026	733.614	10868.356	199209.244
137		0.138	19.550	1	289.631	1141.676	17.217	2.105	0.013	752.949	11154.800	210364.044
141	21	0.204	27.686	1	410.157	1169.362	15.779	0.586	0.036	769.350	11397.778	221761.822
144		0.149	20.906	1	309.719	1190.268	16.498	1.346	0.025	787.218	11662.489	233424.311
Initial conc.						1198.300	20499.900	357.900	0.000	20857.800		

TKW-26

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	0.634	80.690	1	1195.402	1195.402	17.204	10.651	0.224	28.079	415.985	415.985
4		0.201	27.316	1	404.679	1222.717	0.281	8.104	0.064	36.528	541.156	957.141
8	2	0.157	21.892	1	324.328	1244.610	7.251	8.147	0.081	52.007	770.474	1727.615
11		0.108	15.852	1	234.847	1260.462	6.647	8.795	0.058	67.507	1000.104	2727.719
15	3	0.132	18.811	1	278.674	1279.272	7.443	7.216	0.025	82.191	1217.644	3945.363
18		0.134	19.057	1	282.327	1298.329	7.746	8.484	0.023	98.444	1458.430	5403.793
22	4	0.197	26.823	1	397.374	1325.152	7.607	8.355	0.059	114.465	1695.778	7099.570
25		0.189	25.837	1	382.765	1350.989	8.100	14.674	0.088	137.327	2034.474	9134.044
29	5	0.107	15.729	1	233.020	1366.717	7.905	9.320	0.067	154.619	2290.652	11424.696
32		0.139	19.673	1	291.457	1386.391	8.416	9.750	0.078	172.863	2560.933	13985.630
36	6	0.149	20.906	1	309.719	1407.297	8.321	10.216	0.098	191.498	2837.007	16822.637
39		0.199	27.069	1	401.026	1434.366	8.666	8.551	0.058	208.773	3092.933	19915.570
43	7	0.577	73.663	1	1091.311	1508.030	10.073	10.487	0.136	229.469	3399.541	23315.111
46		0.097	14.496	1	214.759	1522.526	8.529	8.934	0.083	247.015	3659.481	26974.593
50	8	0.113	16.468	1	243.977	1538.994	8.768	10.144	0.125	266.052	3941.511	30916.104
53		0.096	14.373	1	212.933	1553.367	8.785	10.892	0.138	285.867	4235.067	35151.170
57	9	0.161	22.385	1	331.633	1575.753	9.334	10.262	0.119	305.582	4527.141	39678.311
60		0.165	22.878	1	338.937	1598.631	9.460	9.889	0.104	325.035	4815.333	44493.644
64	10	0.143	20.166	1	298.762	1618.797	9.608	9.228	0.068	343.939	5095.393	49589.037
67		0.122	17.578	1	260.413	1636.375	10.248	10.761	0.128	365.076	5408.533	54997.570
71	11	0.122	17.578	1	260.413	1653.953	10.707	9.109	0.105	384.997	5703.659	60701.230
74		0.058	9.689	1	143.539	1663.642	9.017	10.319	0.135	404.468	5992.119	66693.348
78	12	0.085	13.017	1	192.845	1676.659	10.684	9.900	0.143	425.195	6299.185	72992.533
81		0.326	42.724	1	632.947	1719.383	9.418	9.254	0.101	443.968	6577.304	79569.837

TKW-26

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.103	15.236	1	225.716	1734.619	10.320	8.023	0.079	462.390	6850.222	86420.059
88		0.122	17.578	1	260.413	1752.196	9.748	7.362	0.077	479.577	7104.844	93524.904
92	14	0.110	16.099	1	238.499	1768.295	9.341	7.478	0.079	496.475	7355.185	100880.089
95		0.083	12.771	1	189.193	1781.066	9.980	8.427	0.124	515.006	7629.719	108509.807
99	15	0.093	14.003	1	207.454	1795.069	9.982	8.288	0.095	533.371	7901.793	116411.600
102		0.075	11.784	1	174.584	1806.853	10.066	8.602	0.124	552.163	8180.193	124591.793
106	16	0.155	21.646	1	320.676	1828.499	13.077	7.242	0.068	572.550	8482.222	133074.015
109		0.237	31.753	1	470.420	1860.252	16.055	7.522	0.093	596.220	8832.889	141906.904
113	17	0.080	12.401	1	183.714	1872.653	15.730	7.163	0.076	619.189	9173.170	151080.074
116		0.096	14.373	1	212.933	1887.026	16.591	6.762	0.074	642.616	9520.237	160600.311
120	18	0.147	20.659	1	306.066	1907.685	15.600	9.747	0.177	668.140	9898.370	170498.681
123		0.110	16.099	1	238.499	1923.784	16.330	6.986	0.087	691.543	10245.081	180743.763
127	19	0.119	17.208	1	254.934	1940.992	15.866	6.495	0.087	713.991	10577.644	191321.407
130		0.139	19.673	1	291.457	1960.665	15.750	6.898	0.095	736.734	10914.578	202235.985
134	20	0.142	20.043	1	296.936	1980.709	16.037	7.739	0.105	760.615	11268.370	213504.356
137		0.698	88.579	1	1312.275	2069.287	17.953	7.778	0.120	786.466	11651.348	225155.704
141	21	0.115	16.715	1	247.630	2086.002	16.147	7.949	0.110	810.672	12009.956	237165.659
144		0.117	16.962	1	251.282	2102.964	15.123	9.130	0.187	835.112	12372.032	249537.692
Initial conc.						1198.300	20499.900	357.900	0.000	20857.800		

TKW-27

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	0.601	76.622	1	1135.139	1135.139	0.810	26.386	0.077	27.273	404.044	404.044
4		0.177	24.357	1	360.851	1159.496	0.306	8.495	0.106	36.180	536.000	940.044
8	2	0.240	32.123	1	475.898	1191.619	0.166	7.239	0.056	43.641	646.533	1586.578
11		0.205	27.809	1	411.983	1219.428	0.192	6.244	0.087	50.164	743.170	2329.748
15	3	0.225	30.274	1	448.506	1249.702	0.113	6.528	0.075	56.880	842.667	3172.415
18		0.162	22.508	1	333.459	1272.211	0.275	5.053	0.061	62.269	922.504	4094.919
22	4	0.174	23.988	1	355.373	1296.198	0.239	6.470	0.105	69.083	1023.452	5118.370
25		0.195	26.576	1	393.722	1322.775	0.623	5.887	0.137	75.730	1121.926	6240.296
29	5	0.211	28.548	1	422.940	1351.323	0.366	6.065	0.109	82.270	1218.815	7459.111
32		0.234	31.384	1	464.942	1382.707	0.332	4.917	0.099	87.618	1298.044	8757.156
36	6	0.281	37.177	1	550.771	1419.884	35.961	6.381	0.132	130.092	1927.289	10684.444
39		0.218	29.411	1	435.723	1449.295	27.295	5.129	0.126	162.642	2409.511	13093.956
43	7	0.231	31.014	1	459.463	1480.309	33.469	5.584	0.125	201.820	2989.926	16083.881
46		0.195	26.576	1	393.722	1506.885	26.943	4.168	0.137	233.068	3452.859	19536.741
50	8	0.231	31.014	1	459.463	1537.899	28.530	5.101	0.164	266.863	3953.526	23490.267
53		0.243	32.493	1	481.377	1570.392	21.366	4.948	0.225	293.402	4346.696	27836.963
57	9	0.231	31.014	1	459.463	1601.405	25.064	4.816	0.151	323.433	4791.600	32628.563
60		0.261	34.712	1	514.248	1636.117	21.063	5.201	0.279	349.976	5184.830	37813.393
64	10	0.230	30.890	1	457.637	1667.008	25.241	4.882	0.188	380.287	5633.881	43447.274
67		0.225	30.274	1	448.506	1697.282	17.904	4.627	0.272	403.090	5971.704	49418.978
71	11	0.350	45.682	1	676.775	1742.964	19.643	4.206	0.189	427.128	6327.822	55746.800
74		0.703	89.195	1	1321.406	1832.159	14.118	4.155	0.284	445.685	6602.741	62349.541
78	12	0.428	55.297	1	819.215	1887.456	16.940	3.931	0.209	466.765	6915.037	69264.578
81		0.260	34.588	1	512.421	1922.044	11.820	4.236	0.657	483.478	7162.637	76427.215

TKW-27

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.347	45.313	1	671.297	1967.357	11.777	3.386	0.231	498.872	7390.696	83817.911
88		0.273	36.191	1	536.161	2003.548	12.075	3.806	0.333	515.086	7630.904	91448.815
92	14	0.389	50.490	1	747.995	2054.037	13.855	4.094	0.351	533.386	7902.015	99350.830
95		0.376	48.887	1	724.255	2102.925	12.941	3.896	0.364	550.587	8156.844	107507.674
99	15	0.484	62.200	1	921.479	2165.124	19.212	4.567	0.397	574.763	8515.007	116022.681
102		0.388	50.366	1	746.169	2215.491	14.469	3.892	0.397	593.521	8792.904	124815.585
106	16	0.305	40.135	1	594.598	2255.626	17.503	4.333	0.447	615.804	9123.022	133938.607
109		0.299	39.396	1	583.641	2295.022	13.834	3.348	0.411	633.397	9383.659	143322.267
113	17	0.278	2.540	1	37.622	2297.562	24.967	5.470	0.744	664.578	9845.600	153167.867
116		0.256	34.095	1	505.117	2331.657	19.077	3.553	0.241	687.449	10184.430	163352.296
120	18	0.209	28.302	1	419.288	2359.959	28.036	6.021	1.617	723.123	10712.933	174065.230
123		0.276	36.561	1	541.640	2396.520	22.605	5.889	1.196	752.813	11152.785	185218.015
127	19	0.233	31.260	1	463.115	2427.780	35.877	8.596	2.306	799.592	11845.807	197063.822
130		0.300	39.519	1	585.467	2467.299	30.825	7.679	2.560	840.656	12454.163	209517.985
134	20	0.282	37.300	1	552.597	2504.599	52.362	14.403	6.272	913.693	13536.193	223054.178
137		0.352	45.929	1	680.427	2550.528	41.145	13.791	7.246	975.875	14457.407	237511.585
141	21	0.327	42.847	1	634.774	2593.375	58.208	20.875	13.750	1068.708	15832.711	253344.296
144		0.418	54.064	1	800.953	2647.440	54.559	22.251	17.601	1163.119	17231.393	270575.689
Initial conc.						1198.300	20499.900	357.900	0.000	20857.800		

TKW-28

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	0.794	100.412	1	1487.586	100.412	17.777	7.405	0.009	25.191	373.200	373.200
4		0.409	52.955	1	784.518	153.367	48.759	8.602	0.020	82.572	1223.289	1596.489
8	2	0.293	38.656	1	572.684	192.023	35.578	7.100	0.015	125.265	1855.778	3452.267
11		0.191	26.083	1	386.417	218.106	28.042	5.455	0.014	158.776	2352.237	5804.504
15	3	0.348	45.436	1	673.123	263.542	34.659	5.880	0.022	199.337	2953.141	8757.644
18		0.161	22.385	1	331.633	285.927	26.684	4.015	0.018	230.054	3408.207	12165.852
22	4	0.195	26.576	1	393.722	312.504	29.653	3.978	0.015	263.700	3906.667	16072.519
25		0.336	43.957	1	651.209	356.460	29.383	3.254	0.018	296.355	4390.444	20462.963
29	5	0.173	23.864	1	353.546	380.325	27.797	1.298	0.028	325.478	4821.896	25284.859
32		0.381	49.504	1	733.386	429.828	29.396	1.269	0.028	356.171	5276.607	30561.467
36	6	0.266	35.328	1	523.378	465.156	38.626	1.417	0.029	396.243	5870.267	36431.733
39		0.227	30.521	1	452.158	495.677	29.900	1.097	0.029	427.269	6329.911	42761.644
43	7	0.213	28.795	1	426.592	524.472	33.724	1.138	0.030	462.161	6846.830	49608.474
46		0.230	30.890	1	457.637	555.362	23.095	0.732	0.026	486.014	7200.207	56808.681
50	8	0.272	36.068	1	534.335	591.430	31.591	0.950	0.029	518.584	7682.726	64491.407
53		0.395	51.229	1	758.952	642.659	26.465	0.810	0.028	545.887	8087.215	72578.622
57	9	0.328	42.970	1	636.600	685.630	29.152	0.859	0.029	575.927	8532.252	81110.874
60		0.276	36.561	1	541.640	722.190	26.736	0.771	0.029	603.463	8940.193	90051.067
64	10	0.332	43.464	1	643.904	765.654	29.891	0.850	0.030	634.234	9396.059	99447.126
67		0.190	25.960	1	384.591	791.614	21.992	0.627	0.028	656.881	9731.570	109178.696
71	11	0.185	25.344	1	375.460	816.957	25.354	0.704	0.028	682.967	10118.030	119296.726
74		0.170	23.495	1	348.068	840.452	19.260	0.533	0.027	702.787	10411.659	129708.385
78	12	0.155	21.646	1	320.676	862.097	23.203	0.658	0.029	726.677	10765.585	140473.970
81		0.137	19.427	1	287.805	881.524	19.696	0.510	0.028	746.911	11065.348	151539.319

TKW-28

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.154	21.522	1	318.850	903.047	20.414	0.577	0.028	767.930	11376.733	162916.052
88		0.162	22.508	1	333.459	925.555	21.131	0.679	0.028	789.768	11700.259	174616.311
92	14	0.158	22.015	1	326.154	947.571	22.571	0.533	0.029	812.901	12042.970	186659.281
95		0.155	21.646	1	320.676	969.216	22.664	0.559	0.030	836.154	12387.459	199046.741
99	15	0.305	40.135	1	594.598	1009.351	23.873	0.565	0.029	860.621	12749.933	211796.674
102		0.263	34.958	1	517.900	1044.310	22.053	0.486	0.029	883.189	13084.274	224880.948
106	16	0.287	37.917	1	561.727	1082.226	18.030	0.350	0.028	901.597	13356.985	238237.933
109		0.159	22.139	1	327.980	1104.365	24.040	0.463	0.031	926.131	13720.452	251958.385
113	17	0.278	36.807	1	545.292	1141.172	25.865	0.532	0.036	952.564	14112.052	266070.437
116		0.176	24.234	1	359.025	1165.406	22.479	0.469	0.029	975.541	14452.452	280522.889
120	18	0.280	37.054	1	548.944	1202.460	26.642	0.528	0.030	1002.741	14855.415	295378.304
123		0.838	105.836	1	1567.936	1308.296	20.667	0.387	0.029	1023.824	15167.756	310546.059
127	19	0.259	34.465	1	510.595	1342.761	23.799	0.450	0.037	1048.110	15527.548	326073.607
130		0.251	33.479	1	495.986	1376.240	20.960	0.378	0.029	1069.477	15844.096	341917.704
134	20	0.244	32.616	1	483.203	1408.856	24.513	0.462	0.035	1094.487	16214.615	358132.319
137		0.222	29.904	1	443.028	1438.761	21.522	0.398	0.031	1116.438	16539.815	374672.133
141	21	0.143	20.166	1	298.762	1458.927	23.179	0.407	0.030	1140.054	16889.681	391561.815
144		0.187	25.590	1	379.112	1484.517	21.180	0.986	0.035	1162.255	17218.585	408780.400
Initial conc.						1198.300	20499.900	357.900	0.000	20857.800		

TKW-29

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	0.554	70.828	5	5246.548	5246.548	18.322	31.782	0.066	50.170	743.259	743.259
4		0.573	73.170	5	5420.032	5612.400	4.279	12.279	0.075	66.803	989.674	1732.933
8	2	0.621	79.087	5	5858.308	6007.836	2.879	9.953	0.033	79.668	1180.267	2913.200
11		0.332	43.464	5	3219.521	6225.154	2.260	8.090	0.036	90.054	1334.133	4247.333
15	3	0.441	56.899	5	4214.773	6509.651	2.726	8.266	0.034	101.080	1497.481	5744.815
18		0.251	33.479	5	2479.930	6677.046	1.487	3.705	0.033	106.305	1574.889	7319.704
22	4	0.449	57.886	5	4287.819	6966.474	2.934	9.272	0.036	118.547	1756.252	9075.956
25		0.301	39.642	5	2936.468	7164.685	2.207	6.633	0.037	127.424	1887.763	10963.719
29	5	0.296	39.026	5	2890.814	7359.815	2.026	6.110	0.036	135.596	2008.830	12972.548
32		0.280	37.054	5	2744.722	7545.084	1.982	6.275	0.038	143.891	2131.719	15104.267
36	6	0.371	48.271	5	3575.621	7786.439	2.256	6.155	0.037	152.339	2256.874	17361.141
39		0.286	37.793	5	2799.507	7975.405	1.961	5.550	0.034	159.884	2368.652	19729.793
43	7	0.249	33.233	5	2461.669	8141.568	2.399	6.073	0.037	168.393	2494.711	22224.504
46		0.277	36.684	5	2717.330	8324.988	1.807	4.529	0.035	174.764	2589.096	24813.600
50	8	0.395	51.229	5	3794.759	8581.134	2.417	5.582	0.036	182.799	2708.133	27521.733
53		0.318	41.738	5	3091.691	8789.823	1.935	4.556	0.038	189.328	2804.859	30326.593
57	9	0.483	62.077	5	4598.265	9100.206	2.572	5.514	0.043	197.457	2925.289	33251.881
60		0.349	45.559	5	3374.744	9328.001	2.104	4.601	0.636	204.798	3034.044	36285.926
64	10	0.501	64.295	5	4762.618	9649.478	2.625	5.328	0.037	212.788	3152.415	39438.341
67		0.382	49.627	5	3676.059	9897.612	2.171	4.402	0.037	219.398	3250.341	42688.681
71	11	0.415	53.695	5	3977.374	10166.085	2.758	5.098	0.040	227.294	3367.319	46056.000
74		0.269	35.698	5	2644.284	10344.574	2.400	4.435	0.044	234.173	3469.230	49525.230
78	12	0.407	52.708	5	3904.328	10608.116	2.992	4.714	0.041	241.920	3584.000	53109.230
81		0.230	30.890	5	2288.185	10762.568	2.400	4.135	0.043	248.498	3681.452	56790.681

TKW-29

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.342	44.696	5	3310.829	10986.049	2.272	3.469	0.044	254.283	3767.156	60557.837
88		0.293	38.656	5	2863.422	11179.330	2.031	3.829	0.049	260.192	3854.696	64412.533
92	14	0.351	45.806	5	3393.006	11408.358	2.971	4.261	0.046	267.470	3962.519	68375.052
95		0.424	54.804	5	4059.550	11682.378	2.766	3.783	0.048	274.067	4060.252	72435.304
99	15	0.798	100.905	5	7474.451	12186.903	3.918	4.640	0.053	282.678	4187.822	76623.126
102		0.381	49.504	5	3666.928	12434.421	3.100	3.820	0.051	289.649	4291.096	80914.222
106	16	0.791	100.042	5	7410.536	12934.632	5.495	4.152	0.057	299.353	4434.859	85349.081
109		0.513	65.775	5	4872.187	13263.505	3.192	3.642	0.058	306.245	4536.963	89886.044
113	17	1.016	127.777	5	9464.955	13902.389	4.901	5.064	0.072	316.282	4685.659	94571.704
116		0.850	107.315	5	7949.250	14438.963	3.692	4.043	0.065	324.082	4801.215	99372.919
120	18	0.984	123.832	5	9172.771	15058.125	3.901	4.388	0.071	332.442	4925.067	104297.985
123		0.704	89.318	5	6616.161	15504.716	5.563	4.749	0.080	342.834	5079.022	109377.007
127	19	0.856	108.054	5	8004.035	16044.989	3.836	5.110	0.089	351.869	5212.874	114589.881
130		0.730	92.523	5	6853.560	16507.604	2.771	3.429	0.064	358.133	5305.674	119895.556
134	20	0.880	111.013	5	8223.173	17062.668	3.082	4.303	0.076	365.594	5416.207	125311.763
137		0.518	66.391	5	4917.841	17394.622	2.401	3.204	0.067	371.266	5500.237	130812.000
141	21	0.944	118.902	5	8807.541	17989.131	3.648	4.079	0.077	379.070	5615.852	136427.852
144		0.383	49.738	5	3684.276	18237.820	2.476	0.005	0.023	381.574	5652.948	142080.800
Initial conc.						1198.300	20499.900	357.900	0.000	20857.800		

TKW-30

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	1.943	242.044	1	3585.832	3585.832	23.700	18.447	0.049	42.196	625.126	625.126
4		2.473	307.374	1	4553.692	3893.206	59.557	4.411	0.030	106.194	1573.244	2198.370
8	2	1.196	149.965	1	2221.698	4043.171	55.502	3.981	0.026	165.702	2454.837	4653.207
11		0.858	108.301	1	1604.459	4151.472	51.446	3.550	0.021	220.719	3269.904	7923.111
15	3	0.332	43.464	1	643.904	4194.935	43.850	3.025	0.020	267.613	3964.637	11887.748
18		0.582	74.280	1	1100.442	4269.215	36.254	2.500	0.018	306.385	4539.037	16426.785
22	4	0.392	50.859	1	753.473	4320.075	31.283	2.210	0.017	339.895	5035.481	21462.267
25		0.462	59.488	1	881.304	4379.563	29.290	1.939	0.016	371.140	5498.370	26960.637
29	5	0.374	48.641	1	720.603	4428.203	26.017	1.678	0.022	398.857	5908.993	32869.630
32		0.261	34.712	1	514.248	4462.915	25.564	1.527	0.017	425.965	6310.593	39180.222
36	6	0.554	70.828	1	1049.310	4533.744	23.888	1.442	0.017	451.312	6686.104	45866.326
39		0.366	47.655	1	705.993	4581.398	22.869	1.351	0.016	475.548	7045.156	52911.481
43	7	0.242	32.370	1	479.551	4613.768	22.251	1.374	0.016	499.189	7395.393	60306.874
46		0.334	43.710	1	647.557	4657.478	22.796	1.240	0.016	523.241	7751.719	68058.593
50	8	0.204	27.686	1	410.157	4685.163	20.895	1.162	0.015	545.313	8078.711	76137.304
53		0.285	37.670	1	558.075	4722.834	24.428	1.319	0.015	571.075	8460.370	84597.674
57	9	0.233	31.260	1	463.115	4754.094	19.388	1.053	0.015	591.531	8763.422	93361.096
60		0.322	42.231	1	625.643	4796.325	22.703	1.230	0.016	615.480	9118.222	102479.319
64	10	0.201	27.316	1	404.679	4823.641	20.383	1.047	0.015	636.925	9435.926	111915.244
67		0.130	18.564	1	275.022	4842.204	23.700	1.180	0.015	661.820	9804.741	121719.985
71	11	0.222	29.904	1	443.028	4872.109	19.387	1.046	0.015	682.268	10107.674	131827.659
74		0.158	22.015	1	326.154	4894.124	23.219	1.175	0.015	706.677	10469.289	142296.948
78	12	0.152	21.276	1	315.197	4915.400	18.250	0.926	0.015	725.868	10753.600	153050.548
81		0.162	22.508	1	333.459	4937.909	18.237	0.909	0.014	745.028	11037.452	164088.000

TKW-30

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.302	39.766	1	589.120	4977.674	17.301	0.868	0.015	763.212	11306.844	175394.844
88		0.157	21.892	1	324.328	4999.566	18.637	0.881	0.015	782.745	11596.222	186991.067
92	14	0.184	25.220	1	373.634	5024.787	18.708	0.015	0.010	801.478	11873.748	198864.815
95		0.136	19.304	1	285.979	5044.090	21.509	0.846	0.017	823.850	12205.185	211070.000
99	15	0.200	27.193	1	402.852	5071.283	17.684	0.780	0.023	842.337	12479.067	223549.067
102		0.183	25.097	1	371.808	5096.380	18.730	1.041	0.016	862.124	12772.207	236321.274
106	16	0.194	26.453	1	391.896	5122.833	17.962	0.763	0.019	880.868	13049.896	249371.170
109		0.169	23.371	1	346.242	5146.204	19.423	0.859	0.017	901.167	13350.622	262721.793
113	17	0.138	19.550	1	289.631	5165.754	17.155	0.699	0.017	919.038	13615.378	276337.170
116		0.150	21.029	1	311.545	5186.783	19.317	0.787	0.016	939.158	13913.452	290250.622
120	18	0.135	19.180	1	284.153	5205.964	18.334	0.746	0.022	958.260	14196.444	304447.067
123		0.200	27.193	1	402.852	5233.156	18.165	0.726	0.015	977.166	14476.533	318923.600
127	19	0.177	24.357	1	360.851	5257.514	16.386	0.666	0.018	994.236	14729.422	333653.022
130		0.144	20.290	1	300.588	5277.803	19.552	0.741	0.019	1014.548	15030.341	348683.363
134	20	0.199	27.069	1	401.026	5304.873	17.606	0.680	0.017	1032.851	15301.496	363984.859
137		0.171	2.540	1	37.622	5307.412	18.318	0.706	0.017	1051.892	15583.585	379568.444
141	21	0.142	20.043	1	296.936	5327.455	16.950	0.684	0.018	1069.544	15845.096	395413.541
144		0.728	92.277	1	1367.060	5419.732	20.441	0.140	0.016	1090.141	16150.237	411563.778
Initial conc.						1198.300	20499.900	357.900	0.000	20857.800		

TKW-39

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	0.724	91.783	10	1359.755	1359.755	363.010	1270.870	5.920	1639.800	24293.333	24293.333
4		0.567	72.431	10	1073.050	1432.186	35.620	994.270	7.790	2677.480	39666.370	63959.704
8	2	0.773	97.823	10	1449.236	1530.009	103.335	203.170	3.170	2987.155	44254.148	108213.852
11		0.717	90.921	10	1346.972	1620.930	75.454	133.710	4.750	3201.069	47423.244	155637.096
15	3	0.329	43.094	10	638.426	1664.024	168.210	60.770	3.390	3433.439	50865.763	206502.859
18		0.287	37.917	10	561.727	1701.940	389.350	64.860	2.500	3890.149	57631.837	264134.696
22	4	0.248	33.109	10	490.508	1735.050	294.330	61.620	3.350	4249.449	62954.800	327089.496
25		0.276	36.561	10	541.640	1771.610	215.160	53.850	4.220	4522.679	67002.652	394092.148
29	5	0.348	45.436	10	673.123	1817.046	747.510	45.860	3.980	5320.029	78815.244	472907.393
32		0.379	49.257	10	729.733	1866.303	478.055	46.600	3.060	5847.744	86633.244	559540.637
36	6	0.281	37.177	10	550.771	1903.480	208.600	9.306	0.176	6065.826	89864.089	649404.726
39		0.354	46.175	10	684.080	1949.656	242.180	12.946	0.308	6321.260	93648.296	743053.022
43	7	0.297	39.149	10	579.989	1988.805	170.760	9.713	0.220	6501.953	96325.230	839378.252
46		0.388	50.366	10	746.169	2039.171	221.560	16.670	0.411	6740.594	99860.652	939238.904
50	8	0.319	41.861	10	620.164	2081.032	176.630	11.847	0.349	6929.420	102658.074	1041896.978
53		0.366	47.655	10	705.993	2128.687	202.790	15.114	0.430	7147.754	105892.652	1147789.630
57	9	0.363	47.285	10	700.515	2175.972	204.600	13.594	0.404	7366.352	109131.141	1256920.770
60		0.411	53.201	10	788.170	2229.173	192.160	16.411	0.531	7575.454	112228.948	1369149.719
64	10	0.310	40.752	10	603.729	2269.925	144.090	12.423	0.418	7732.385	114553.852	1483703.570
67		0.332	43.464	10	643.904	2313.388	155.680	13.532	0.512	7902.109	117068.281	1600771.852
71	11	0.275	36.437	10	539.814	2349.826	123.290	11.728	0.471	8037.598	119075.526	1719847.378
74		0.388	50.366	10	746.169	2400.192	105.720	14.834	0.550	8158.702	120869.659	1840717.037
78	12	0.320	41.984	10	621.990	2442.176	189.910	10.666	0.472	8359.750	123848.148	1964565.185
81		0.302	39.766	10	589.120	2481.942	196.312	11.498	0.584	8568.144	126935.467	2091500.652

TKW-39

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.278	36.807	10	545.292	2518.749	222.283	10.216	0.564	8801.207	130388.252	2221888.904
88		0.297	39.149	10	579.989	2557.898	200.800	0.651	10.173	9012.831	133523.422	2355412.326
92	14	0.251	33.479	10	495.986	2591.378	236.327	8.865	0.633	9258.656	137165.270	2492577.596
95		0.279	36.930	10	547.118	2628.308	206.262	11.142	0.839	9476.899	140398.499	2632976.095
99	15	0.286	37.793	10	559.901	2666.101	241.119	7.907	0.585	9726.510	144096.440	2777072.535
102		0.272	36.068	10	534.335	2702.169	204.000	9.048	0.705	9940.263	147263.151	2924335.686
106	16	0.284	37.547	10	556.249	2739.716	234.000	7.336	0.637	10182.236	150847.936	3075183.622
109		0.326	42.724	10	632.947	2782.440	234.000	10.021	0.885	10427.142	154476.173	3229659.796
113	17	0.264	35.082	10	519.726	2817.521	215.000	6.579	0.640	10649.361	157768.307	3387428.102
116		0.259	34.465	10	510.595	2851.986	250.000	8.397	0.826	10908.584	161608.647	3549036.750
120	18	0.299	39.396	10	583.641	2891.382	201.000	7.024	0.777	11117.385	164701.996	3713738.745
123		0.276	36.561	10	541.640	2927.943	246.000	9.030	1.045	11373.460	168495.699	3882234.444
127	19	0.248	33.109	10	490.508	2961.052	173.000	5.679	0.706	11552.845	171153.255	4053387.699
130		0.338	44.203	10	654.861	3005.255	301.000	11.114	1.309	11866.268	175796.559	4229184.258
134	20	0.296	39.026	10	578.163	3044.281	231.000	6.136	0.806	12104.210	179321.625	4408505.883
137		0.359	46.792	10	693.210	3091.073	245.000	7.001	0.930	12357.141	183068.751	4591574.634
141	21	0.284	37.547	10	556.249	3128.620	185.000	5.520	0.802	12548.463	185903.151	4777477.785
144		0.345	45.066	10	667.644	3173.686	273.000	8.464	1.229	12831.156	190091.196	4967568.981
Initial conc.						1198.300	20499.900	357.900	0.000	20857.800		

TKW-59

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	0.263	34.958	10	5178.999	5178.999	392.273	77.420	5.140	474.833	7034.563	7034.563
4		0.156	21.769	10	3225.018	5396.688	227.202	96.652	3.302	801.989	11881.311	18915.874
8	2	0.121	17.455	10	2585.866	5571.234	62.130	30.461	1.499	896.079	13275.237	32191.111
11		0.129	18.441	10	2731.958	5755.641	70.343	27.215	2.742	996.379	14761.163	46952.274
15	3	0.127	18.194	10	2695.435	5937.583	67.169	16.116	2.576	1082.240	16033.178	62985.452
18		0.120	17.331	10	2567.604	6110.896	63.995	18.052	6.249	1170.536	17341.267	80326.719
22	4	0.110	16.099	10	2384.989	6271.883	66.521	9.430	2.790	1249.277	18507.800	98834.519
25		0.268	35.575	5	2635.153	6449.755	72.152	59.700	45.500	1426.629	21135.237	119969.756
29	5	0.374	48.641	5	3603.013	6692.959	67.483	66.800	58.800	1619.712	23995.726	143965.481
32		0.598	76.252	5	5648.301	7074.219	66.784	61.200	16.500	1764.196	26136.230	170101.711
36	6	0.536	68.610	5	5082.194	7417.267	45.814	4.587	4.256	1818.853	26945.963	197047.674
39		0.829	104.726	5	7757.504	7940.899	81.271	7.211	5.712	1913.047	28341.430	225389.104
43	7	0.527	67.500	5	5000.018	8278.400	37.148	4.645	2.533	1957.373	28998.111	254387.215
46		0.731	92.646	5	6862.691	8741.632	32.203	5.677	1.980	1997.233	29588.630	283975.844
50	8	0.731	92.646	5	6862.691	9204.863	21.444	5.592	0.742	2025.011	30000.156	313976.000
53		0.661	84.018	5	6223.538	9624.952	16.254	5.451	0.422	2047.138	30327.963	344303.963
57	9	0.689	87.469	5	6479.199	10062.298	24.321	8.954	0.620	2081.033	30830.111	375134.074
60		0.425	54.927	5	4068.681	10336.934	13.356	4.781	0.280	2099.450	31102.956	406237.030
64	10	0.279	36.930	5	2735.591	10521.586	8.311	2.844	0.181	2110.786	31270.896	437507.926
67		0.516	66.144	5	4899.579	10852.308	16.079	6.097	0.309	2133.271	31604.007	469111.933
71	11	0.396	51.353	5	3803.889	11109.071	13.191	6.668	0.375	2153.505	31903.770	501015.704
74		0.408	52.832	5	3913.458	11373.229	11.747	5.909	0.350	2171.511	32170.526	533186.230
78	12	0.386	50.120	5	3712.582	11623.828	12.758	5.735	0.409	2190.413	32450.556	565636.785
81		0.305	40.135	5	2972.991	11824.505	7.726	4.080	0.319	2202.538	32630.185	598266.970

TKW-59

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.404	52.339	5	3876.935	12086.198	9.228	5.642	0.496	2217.904	32857.830	631124.800
88		0.218	29.411	5	2178.616	12233.255	4.720	2.358	0.188	2225.170	32965.474	664090.274
92	14	0.216	29.165	5	2160.354	12379.079	6.636	3.297	0.239	2235.342	33116.170	697206.444
95		0.169	23.371	5	1731.209	12495.935	5.401	2.329	0.156	2243.228	33233.000	730439.444
99	15	0.279	36.930	5	2735.591	12680.588	7.972	4.119	0.317	2255.636	33416.822	763856.267
102		0.187	25.590	5	1895.562	12808.538	5.790	2.492	0.188	2264.106	33542.304	797398.570
106	16	0.310	40.752	5	3018.645	13012.297	7.950	3.895	0.313	2276.264	33722.422	831120.993
109		0.280	37.054	5	2744.722	13197.566	6.907	3.515	0.308	2286.994	33881.385	865002.378
113	17	0.218	29.411	5	2178.616	13344.622	5.259	2.905	0.246	2295.404	34005.978	899008.356
116		0.381	49.504	5	3666.928	13592.140	6.634	3.158	0.390	2305.586	34156.822	933165.178
120	18	0.309	40.628	5	3009.514	13795.282	6.397	3.496	0.399	2315.878	34309.296	967474.474
123		0.302	39.766	5	2945.599	13994.110	5.317	2.697	0.284	2324.176	34432.230	1001906.704
127	19	0.296	39.026	5	2890.814	14189.240	6.883	3.369	0.318	2334.746	34588.822	1036495.526
130		0.201	27.316	5	2023.393	14325.819	4.652	2.563	0.225	2342.186	34699.044	1071194.570
134	20	0.204	27.686	5	2050.785	14464.247	6.644	3.211	0.279	2352.320	34849.178	1106043.748
137		0.222	29.904	5	2215.139	14613.769	25.611	9.504	0.975	2388.410	35383.844	1141427.593
141	21	0.147	20.659	5	1530.332	14717.066	3.631	3.369	0.102	2395.512	35489.059	1176916.652
144		0.148	20.783	5	1539.463	14820.980	4.606	1.984	0.590	2402.692	35595.430	1212512.081
Initial conc.						1198.300	20499.900	357.900	0.000	20857.800		

TKW-60

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	0.581	74.157	1	1098.616	1098.616	302.239	261.735	1.337	565.311	8374.978	8374.978
4		0.307	40.382	1	598.250	1138.998	213.672	164.320	3.160	946.463	14021.674	22396.652
8	2	0.194	26.453	1	391.896	1165.450	125.105	65.150	2.810	1139.528	16881.896	39278.548
11		0.202	27.439	1	406.505	1192.890	109.275	46.420	2.900	1298.123	19231.453	58510.001
15	3	0.192	26.206	1	388.243	1219.096	156.000	55.080	5.450	1514.653	22439.305	80949.307
18		0.219	29.535	1	437.549	1248.631	146.234	16.017	1.076	1677.980	24858.964	105808.271
22	4	0.210	28.425	1	421.114	1277.056	171.469	17.619	0.416	1867.484	27666.431	133474.702
25		0.175	24.111	1	357.199	1301.167	171.469	13.726	0.424	2053.103	30416.342	163891.044
29	5	0.202	27.439	1	406.505	1328.606	143.024	19.354	2.153	2217.634	32853.840	196744.884
32		0.189	25.837	1	382.765	1354.442	130.083	19.909	5.376	2373.002	35155.588	231900.473
36	6	0.164	22.755	1	337.111	1377.197	111.054	13.037	7.605	2504.698	37106.640	269007.113
39		0.167	23.125	1	342.589	1400.322	113.687	11.630	8.107	2638.122	39083.292	308090.404
43	7	0.217	29.288	1	433.897	1429.610	80.122	19.771	11.975	2749.990	40740.596	348831.000
46		0.354	46.175	1	684.080	1475.786	91.355	23.614	9.859	2874.818	42589.899	391420.899
50	8	1.094	137.392	1	2035.431	1613.177	78.351	76.248	17.949	3047.366	45146.166	436567.065
53		1.032	129.749	1	1922.209	1742.926	132.756	56.523	11.822	3248.467	48125.440	484692.505
57	9	1.306	163.524	1	2422.575	1906.450	97.153	44.983	9.007	3399.610	50364.596	535057.101
60		0.993	124.942	1	1850.990	2031.392	85.086	30.145	5.777	3520.618	52157.307	587214.407
64	10	0.730	92.523	1	1370.712	2123.915	70.298	24.860	3.722	3619.498	53622.196	640836.603
67		0.674	85.620	1	1268.448	2209.535	63.865	22.094	3.126	3708.583	54941.973	695778.576
71	11	0.673	85.497	1	1266.621	2295.032	66.210	17.669	2.300	3794.762	56218.699	751997.276
74		0.853	107.685	1	1595.328	2402.717	52.731	17.326	2.219	3867.038	57289.455	809286.730
78	12	0.573	73.170	1	1084.006	2475.887	53.825	17.480	2.094	3940.437	58376.847	867663.578
81		0.631	80.320	1	1189.923	2556.207	55.825	15.122	1.821	4013.205	59454.892	927118.470

TKW-60

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.505	64.788	1	959.828	2620.995	52.874	11.378	1.413	4078.870	60427.707	987546.176
88		0.524	67.130	1	994.525	2688.126	40.883	12.478	1.419	4133.650	61239.262	1048785.439
92	14	0.495	63.556	1	941.567	2751.682	44.583	11.497	1.294	4191.024	62089.247	1110874.686
95		0.329	43.094	1	638.426	2794.775	42.043	9.861	1.090	4244.018	62874.342	1173749.028
99	15	0.469	60.351	1	894.087	2855.126	42.954	12.259	1.226	4300.457	63710.476	1237459.504
102		0.410	53.078	1	786.344	2908.204	43.078	10.735	1.065	4355.335	64523.483	1301982.987
106	16	0.309	40.628	1	601.903	2948.833	18.359	9.652	1.102	4384.448	64954.787	1366937.773
109		0.321	42.108	1	623.817	2990.940	14.231	11.617	0.965	4411.261	65352.016	1432289.790
113	17	0.411	53.201	1	788.170	3044.142	17.211	11.820	1.156	4441.448	65799.231	1498089.021
116		0.401	51.969	1	769.909	3096.111	15.975	10.339	1.043	4468.805	66204.520	1564293.541
120	18	0.221	29.781	1	441.202	3125.892	16.482	10.980	1.067	4497.334	66627.172	1630920.713
123		0.309	40.628	1	601.903	3166.520	15.284	10.389	1.033	4524.040	67022.816	1697943.529
127	19	0.313	41.121	1	609.207	3207.642	16.956	10.861	1.093	4552.950	67451.113	1765394.641
130		0.323	42.354	1	627.469	3249.996	13.636	8.594	0.926	4576.106	67794.164	1833188.806
134	20	0.260	34.588	1	512.421	3284.584	16.089	9.987	1.012	4603.194	68195.468	1901384.274
137		0.239	32.000	1	474.072	3316.584	15.784	13.775	1.244	4633.997	68651.801	1970036.076
141	21	0.279	36.930	1	547.118	3353.515	14.675	17.562	1.476	4667.709	69151.246	2039187.321
144		0.301	39.642	1	587.294	3393.157	13.565	8.029	0.856	4690.159	69483.839	2108671.160
Initial conc.						1198.300	20499.900	357.900	0.000	20857.800		

TKW-61

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	0.717	90.921	50	1346.972	1346.972	49.501	3.661	0.154	53.316	789.868	789.868
4		0.259	34.465	50	510.595	1381.437	1773.000	3.160	0.566	1830.042	27111.735	27901.603
8	2	0.534	68.363	50	1012.787	1449.800	214.783	4.180	0.466	2049.471	30362.527	58264.130
11		0.520	66.637	50	987.220	1516.438	766.000	4.740	0.589	2820.800	41789.624	100053.754
15	3	0.337	44.080	50	653.035	1560.518	182.000	5.290	0.370	3008.460	44569.772	144623.526
18		0.363	47.285	50	700.515	1607.802	398.000	3.880	0.236	3410.576	50527.046	195150.572
22	4	0.334	43.710	50	647.557	1651.512	434.000	5.300	0.277	3850.153	57039.298	252189.870
25		0.317	41.615	50	616.512	1693.127	51.626	4.860	0.246	3906.885	57879.772	310069.641
29	5	0.243	32.493	50	481.377	1725.620	787.000	3.200	0.246	4697.331	69590.083	379659.724
32		0.248	33.109	50	490.508	1758.729	375.000	2.410	0.214	5074.955	75184.513	454844.237
36	6	0.276	36.561	50	541.640	1795.290	14.823	3.751	0.182	5093.711	75462.379	530306.616
39		0.159	22.139	50	327.980	1817.429	16.493	4.459	0.223	5114.886	75776.083	606082.699
43	7	0.219	29.535	50	437.549	1846.963	11.680	3.426	0.181	5130.173	76002.557	682085.256
46		0.274	36.314	50	537.988	1883.277	14.255	4.951	0.278	5149.657	76291.209	758376.465
50	8	0.263	34.958	50	517.900	1918.236	14.232	4.220	0.266	5168.375	76568.513	834944.978
53		0.245	32.739	50	485.029	1950.975	12.691	4.623	0.272	5185.961	76829.046	911774.024
57	9	0.207	28.055	50	415.635	1979.030	8.707	3.336	0.199	5198.203	77010.409	988784.433
60		0.250	33.356	50	494.160	2012.386	9.799	3.886	0.233	5212.121	77216.601	1066001.034
64	10	0.192	26.206	50	388.243	2038.593	9.791	3.764	0.244	5225.920	77421.031	1143422.065
67		0.196	26.699	50	395.548	2065.292	9.956	4.053	0.278	5240.207	77632.690	1221054.756
71	11	0.181	24.851	50	368.156	2090.143	6.329	2.519	0.174	5249.229	77766.350	1298821.105
74		0.193	26.330	50	390.069	2116.472	8.262	3.097	0.221	5260.809	77937.905	1376759.010
78	12	0.210	28.425	50	421.114	2144.897	8.099	2.785	0.221	5271.914	78102.424	1454861.434
81		0.183	25.097	50	371.808	2169.994	6.913	2.800	0.243	5281.870	78249.920	1533111.354

TKW-61

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.164	22.755	50	337.111	2192.749	4.671	2.156	0.195	5288.892	78353.950	1611465.304
88		0.173	23.864	50	353.546	2216.614	5.123	2.091	0.200	5296.306	78463.787	1689929.090
92	14	0.182	24.974	50	369.982	2241.588	4.305	1.806	0.171	5302.588	78556.853	1768485.944
95		0.235	31.507	50	466.768	2273.094	8.522	3.941	0.355	5315.406	78746.750	1847232.693
99	15	0.203	27.562	50	408.331	2300.657	4.598	2.427	0.216	5322.647	78854.024	1926086.717
102		0.208	28.179	50	417.462	2328.835	4.701	2.818	0.240	5330.406	78968.972	2005055.689
106	16	0.179	24.604	50	364.503	2353.439	8.810	2.206	0.185	5341.607	79134.913	2084190.601
109		0.189	25.837	50	382.765	2379.276	6.702	2.189	0.189	5350.687	79269.431	2163460.033
113	17	0.201	27.316	50	404.679	2406.592	10.127	2.756	0.232	5363.802	79463.727	2242923.760
116		0.214	28.918	50	428.419	2435.510	10.988	3.192	0.282	5378.264	79677.979	2322601.739
120	18	0.212	28.672	50	424.766	2464.182	7.670	2.513	0.220	5388.667	79832.098	2402433.837
123		0.184	25.220	50	373.634	2489.402	6.302	2.327	0.188	5397.484	79962.720	2482396.557
127	19	0.196	26.699	50	395.548	2516.102	9.519	3.515	0.275	5410.793	80159.890	2562556.447
130		0.187	25.590	50	379.112	2541.692	6.277	2.450	0.200	5419.720	80292.142	2642848.590
134	20	0.188	25.713	50	380.939	2567.405	8.277	2.889	0.229	5431.115	80460.957	2723309.547
137		0.184	25.220	50	373.634	2592.625	7.491	0.000	0.121	5438.727	80573.727	2803883.274
141	21	0.204	27.686	50	410.157	2620.311	5.841	2.743	0.225	5447.536	80704.231	2884587.505
144		0.168	23.248	50	344.416	2643.559	2.502	2.263	0.196	5452.497	80777.727	2965365.233
Initial conc.						1198.300	20499.900	357.900	0.000	20857.800		

TKW-62

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	0.993	124.942	5	9254.948	9254.948	362.397	0.318	7.450	370.165	5483.926	5483.926
4		0.472	60.721	2	1799.131	11054.078	671.000	52.400	0.528	1094.093	16208.785	21692.711
8	2	0.865	109.164	2	3234.485	14288.563	91.130	57.900	0.362	1243.485	18422.000	40114.711
11		0.767	97.084	2	2876.559	17165.122	46.182	62.250	0.341	1352.258	20033.452	60148.163
15	3	0.545	69.719	5	5164.371	22329.493	51.494	66.600	0.407	1470.759	21789.022	81937.185
18		0.738	93.509	10	13853.212	36182.705	49.192	70.200	0.572	1590.723	23566.270	105503.455
22	4	0.672	85.374	10	12647.953	48830.658	29.409	64.400	0.375	1684.907	24961.588	130465.043
25		0.623	79.334	10	11753.139	60583.798	22.888	62.200	0.427	1770.422	26228.477	156693.520
29	5	0.688	87.346	10	12940.137	73523.935	18.818	69.700	0.311	1859.251	27544.462	184237.982
32		0.684	86.853	10	12867.091	86391.026	17.149	33.700	0.166	1910.266	28300.240	212538.222
36	6	0.544	69.596	10	10310.481	96701.507	0.362	17.011	0.693	1928.332	28567.884	241106.107
39		0.463	59.611	10	8831.299	105532.806	0.396	19.456	0.699	1948.883	28872.344	269978.450
43	7	0.435	56.160	10	8319.977	113852.783	0.374	16.901	0.604	1966.762	29137.218	299115.668
46		0.440	56.776	10	8411.285	122264.068	0.271	16.753	0.581	1984.367	29398.033	328513.701
50	8	0.229	30.767	10	4558.108	126822.176	0.366	8.278	0.322	1993.333	29530.862	358044.563
53		0.310	40.752	10	6037.289	132859.465	0.356	12.677	0.431	2006.797	29730.321	387774.884
57	9	0.303	39.889	10	5909.459	138768.924	0.345	11.669	0.399	2019.210	29914.218	417689.102
60		0.302	39.766	10	5891.197	144660.122	0.368	11.996	0.414	2031.988	30103.521	447792.624
64	10	0.263	34.958	10	5178.999	149839.121	0.325	11.784	0.411	2044.508	30289.003	478081.627
67		0.253	33.726	10	4996.384	154835.505	0.387	10.236	0.356	2055.487	30451.655	508533.281
71	11	0.211	28.548	10	4229.401	159064.905	0.367	10.308	0.359	2066.521	30615.121	539148.403
74		0.272	36.068	10	5343.352	164408.258	0.340	12.378	0.424	2079.663	30809.818	569958.221
78	12	0.231	31.014	10	4594.631	169002.889	0.381	9.285	0.327	2089.656	30957.862	600916.083
81		0.259	34.465	10	5105.953	174108.842	0.360	9.172	0.342	2099.530	31104.144	632020.227

TKW-62

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.220	29.658	10	4393.754	178502.596	0.417	8.098	0.305	2108.350	31234.810	663255.037
88		0.217	29.288	10	4338.970	182841.566	9.438	7.226	0.266	2125.280	31485.625	694740.662
92	14	0.163	22.632	10	3352.849	186194.415	0.346	8.628	0.317	2134.570	31623.262	726363.924
95		0.215	29.042	10	4302.447	190496.861	13.839	10.029	0.368	2158.806	31982.314	758346.239
99	15	0.197	26.823	10	3973.740	194470.601	11.611	7.151	0.275	2177.843	32264.344	790610.582
102		0.193	26.330	10	3900.694	198371.295	11.293	8.046	0.301	2197.483	32555.307	823165.889
106	16	0.180	24.727	10	3663.294	202034.589	11.625	6.420	0.241	2215.769	32826.210	855992.099
109		0.244	32.616	10	4832.030	206866.620	11.957	9.012	0.339	2237.077	33141.884	889133.984
113	17	0.177	24.357	10	3608.510	210475.129	12.289	5.548	0.210	2255.124	33409.247	922543.231
116		0.183	25.097	10	3718.079	214193.208	11.903	6.908	0.254	2274.189	33691.692	956234.923
120	18	0.178	24.481	10	3626.771	217819.980	11.481	6.233	0.227	2292.130	33957.484	990192.407
123		0.194	26.453	10	3918.955	221738.935	13.903	7.685	0.268	2313.986	34281.277	1024473.684
127	19	0.199	27.069	10	4010.263	225749.198	13.244	6.842	0.242	2334.314	34582.433	1059056.117
130		0.165	22.878	10	3389.372	229138.569	12.525	6.208	0.231	2353.278	34863.381	1093919.498
134	20	0.122	17.578	10	2604.127	231742.697	13.996	6.104	0.212	2373.590	35164.299	1129083.797
137		0.207	28.055	10	4156.355	235899.051	13.781	6.081	0.217	2393.669	35461.766	1164545.563
141	21	0.156	21.769	10	3225.018	239124.070	12.914	6.503	0.220	2413.306	35752.684	1200298.247
144		0.237	31.753	10	4704.200	243828.270	15.745	5.794	0.210	2435.055	36074.892	1236373.139
Initial conc.						1198.300	20499.900	357.900	0.000	20857.800		

TKW-40

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	0.595	75.882	10	11241.817	11241.817	821.639	129.213	1.273	952.125	14105.556	14105.556
4		0.402	52.092	10	7717.348	11762.738	602.759	40.081	0.812	1595.777	23641.141	37746.696
8	2	0.307	40.382	10	5982.505	12166.557	547.234	18.025	1.219	2162.255	32033.407	69780.104
11		0.206	27.932	10	4138.093	12445.879	295.299	9.222	0.599	2467.375	36553.704	106333.807
15	3	0.182	24.974	10	3699.817	12695.616	240.380	6.540	0.702	2714.997	40222.178	146555.985
18		0.323	42.354	10	6274.689	13119.158	308.663	5.427	1.055	3030.142	44890.993	191446.978
22	4	0.215	29.042	10	4302.447	13409.573	207.774	3.807	0.774	3242.497	48036.993	239483.970
25		0.249	33.233	10	4923.338	13741.898	257.352	3.635	1.519	3505.003	51925.970	291409.941
29	5	0.221	29.781	10	4412.016	14039.710	293.076	2.489	0.710	3801.278	56315.230	347725.170
32		0.188	25.713	10	3809.386	14296.843	245.197	2.274	0.735	4049.484	59992.356	407717.526
36	6	0.233	31.260	10	4631.154	14609.446	188.119	1.624	0.527	4239.754	62811.170	470528.696
39		0.272	36.068	10	5343.352	14970.122	251.810	1.884	0.635	4494.083	66579.007	537107.704
43	7	0.152	21.276	10	3151.972	15182.880	184.821	1.312	0.580	4680.796	69345.126	606452.830
46		0.264	35.082	10	5197.260	15533.695	151.884	1.424	0.566	4834.670	71624.741	678077.570
50	8	0.270	35.821	10	5306.829	15891.906	192.111	1.148	0.534	5028.463	74495.748	752573.319
53		0.194	26.453	10	3918.955	16156.436	143.755	1.634	0.912	5174.764	76663.170	829236.489
57	9	0.187	25.590	10	3791.125	16412.337	138.165	0.994	0.424	5314.347	78731.067	907967.556
60		0.203	27.562	10	4083.309	16687.960	161.451	1.576	1.000	5478.374	81161.096	989128.652
64	10	0.130	18.564	10	2750.219	16873.600	130.178	1.078	0.572	5610.202	83114.104	1072242.756
67		0.175	24.111	10	3571.987	17114.709	115.193	1.069	0.620	5727.084	84845.689	1157088.444
71	11	0.128	18.317	10	2713.696	17297.884	100.038	1.004	0.539	5828.665	86350.593	1243439.037
74		0.152	21.276	10	3151.972	17510.642	106.579	1.238	0.911	5937.393	87961.378	1331400.415
78	12	0.208	28.179	10	4174.616	17792.428	45.538	0.960	0.542	5984.433	88658.267	1420058.681
81		0.119	17.208	10	2549.343	17964.509	48.794	1.048	0.634	6034.909	89406.059	1509464.741

TKW-40

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.118	17.085	10	2531.081	18135.357	40.237	1.320	0.651	6077.117	90031.359	1599496.099
88		0.185	25.344	10	3754.602	18388.793	46.019	1.422	0.127	6124.685	90736.070	1690232.169
92	14	0.129	18.441	10	2731.958	18573.200	38.203	2.131	1.981	6167.000	91362.959	1781595.127
95		0.158	22.015	10	3261.541	18793.354	39.156	2.803	5.446	6214.405	92065.255	1873660.382
99	15	0.154	21.522	10	3188.495	19008.577	27.524	2.423	5.830	6250.182	92595.284	1966255.667
102		0.173	23.864	10	3535.464	19247.221	29.133	2.690	7.854	6289.859	93183.092	2059438.759
106	16	0.134	19.057	10	2823.265	19437.791	26.452	2.369	6.944	6325.624	93712.944	2153151.702
109		0.201	27.316	10	4046.786	19710.949	23.771	3.041	6.927	6359.363	94212.781	2247364.483
113	17	0.199	27.069	10	4010.263	19981.642	25.237	3.001	5.183	6392.784	94707.907	2342072.390
116		0.209	28.302	10	4192.878	20264.661	22.938	4.234	3.046	6423.002	95155.581	2437227.970
120	18	0.186	25.467	10	3772.863	20519.330	22.748	3.722	5.276	6454.748	95625.892	2532853.862
123		0.179	24.604	10	3645.033	20765.369	19.121	4.489	5.661	6484.019	96059.536	2628913.399
127	19	0.171	23.618	10	3498.941	21001.548	21.855	3.896	4.464	6514.233	96507.159	2725420.557
130		0.206	27.932	10	4138.093	21280.869	24.588	6.326	6.462	6551.609	97060.877	2822481.434
134	20	0.209	28.302	10	4192.878	21563.888	22.557	5.320	6.189	6585.675	97565.559	2920046.993
137		0.230	30.890	10	4576.369	21872.793	25.091	5.755	6.388	6622.909	98117.173	3018164.166
141	21	0.195	26.576	10	3937.217	22138.556	26.746	4.313	5.008	6658.976	98651.492	3116815.658
144		0.248	33.109	10	4905.076	22469.648	28.400	8.431	8.055	6703.862	99316.470	3216132.127
Initial conc.						1198.300	20499.900	357.900	0.000	20857.800		

TKW-41

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	0.654	83.155	1	1231.925	1231.925	75.733	31.496	0.033	107.262	1589.067	1589.067
4		0.146	20.536	1	304.240	1252.461	24.079	12.100	0.036	143.477	2125.585	3714.652
8	2	0.205	27.809	1	411.983	1280.270	16.836	8.499	0.029	168.841	2501.348	6216.000
11		0.126	18.071	1	267.717	1298.341	15.533	7.423	0.031	191.828	2841.896	9057.896
15	3	0.146	20.536	1	304.240	1318.877	16.928	8.348	0.045	217.149	3217.022	12274.919
18		0.162	22.508	1	333.459	1341.385	17.856	7.840	0.039	242.884	3598.281	15873.200
22	4	0.170	23.495	1	348.068	1364.880	17.236	7.079	0.041	267.240	3959.111	19832.311
25		0.142	20.043	1	296.936	1384.923	16.783	6.486	0.019	290.528	4304.119	24136.430
29	5	0.130	18.564	1	275.022	1403.487	18.294	6.443	0.042	315.307	4671.215	28807.644
32		0.193	26.330	1	390.069	1429.817	19.395	5.846	0.034	340.582	5045.659	33853.304
36	6	0.106	15.606	1	231.194	1445.422	18.637	5.061	0.038	364.318	5397.304	39250.607
39		0.997	125.435	1	282.327	1464.479	18.823	4.884	0.037	388.062	5749.067	44999.674
43	7	0.162	22.508	1	333.459	1486.988	19.286	4.830	0.026	412.204	6106.726	51106.400
46		0.215	29.042	1	430.245	1516.029	22.705	5.352	0.052	440.313	6523.156	57629.556
50	8	0.162	22.508	1	333.459	1538.538	23.356	5.165	0.048	468.882	6946.400	64575.956
53		0.242	32.370	1	479.551	1570.907	21.890	4.752	0.029	495.553	7341.526	71917.481
57	9	0.155	21.646	1	320.676	1592.553	20.358	3.890	0.033	519.834	7701.244	79618.726
60		0.195	26.576	1	393.722	1619.129	0.024	4.462	0.033	524.353	7768.193	87386.919
64	10	0.145	20.413	1	302.414	1639.542	19.789	3.283	0.033	547.458	8110.489	95497.407
67		0.141	19.920	1	295.110	1659.462	21.530	3.439	0.033	572.460	8480.889	103978.296
71	11	0.157	21.892	1	324.328	1681.354	20.158	3.127	0.033	595.778	8826.341	112804.637
74		0.195	26.576	1	393.722	1707.931	24.054	3.485	0.035	623.352	9234.844	122039.481
78	12	0.392	50.859	1	372.721	1733.089	19.970	2.890	0.035	646.247	9574.030	131613.511
81		0.172	23.741	1	351.720	1756.830	21.605	2.816	0.037	670.705	9936.370	141549.881

TKW-41

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.144	20.290	1	300.588	1777.120	20.960	2.661	0.043	694.369	10286.948	151836.830
88		0.141	19.920	1	295.110	1797.040	22.880	2.631	0.045	719.925	10665.556	162502.385
92	14	0.194	26.453	1	391.896	1823.493	24.723	2.470	0.049	747.167	11069.141	173571.526
95		0.172	23.741	1	351.720	1847.234	23.735	2.491	0.036	773.429	11458.207	185029.733
99	15	0.171	23.618	1	349.894	1870.852	28.707	2.320	0.052	804.508	11918.637	196948.370
102		0.202	27.439	1	406.505	1898.291	26.791	2.344	0.049	833.692	12350.993	209299.363
106	16	0.203	27.562	1	408.331	1925.853	25.826	2.243	0.052	861.813	12767.600	222066.963
109		0.224	30.151	1	446.680	1956.004	29.324	2.322	0.064	893.523	13237.378	235304.341
113	17	0.152	21.276	1	315.197	1977.280	27.596	2.132	0.055	923.306	13678.607	248982.948
116		0.176	24.234	1	359.025	2001.514	26.943	1.929	0.068	952.246	14107.348	263090.296
120	18	0.193	26.330	1	390.069	2027.844	27.172	1.973	0.079	981.470	14540.296	277630.593
123		0.195	26.576	1	393.722	2054.420	26.059	2.018	0.077	1009.624	14957.393	292587.985
127	19	0.221	29.781	1	441.202	2084.201	29.043	2.008	0.163	1040.838	15419.822	308007.807
130		0.214	28.918	1	428.419	2113.119	27.884	1.906	0.108	1070.736	15862.756	323870.563
134	20	0.222	29.904	1	443.028	2143.024	27.677	1.730	0.113	1100.256	16300.089	340170.652
137		0.182	24.974	1	369.982	2167.997	27.310	1.767	0.112	1129.445	16732.519	356903.170
141	21	0.175	24.111	1	357.199	2192.108	27.274	1.757	0.115	1158.591	17164.311	374067.481
144		0.184	25.220	1	373.634	2217.329	26.437	1.681	0.075	1186.784	17581.985	391649.467
Initial conc.						1198.300	20499.900	357.900	0.000		20857.800	

TKW-44

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	2.246	279.393	1	4139.156	4139.156	208.890	70.115	0.608	279.613	4142.415	4142.415
4		1.154	144.787	1	2145.000	4283.943	67.112	24.647	0.528	371.900	5509.630	9652.044
8	2	0.482	61.953	1	917.827	4345.896	34.762	12.761	0.142	419.565	6215.778	15867.822
11		0.665	84.511	1	1252.012	4430.407	41.937	14.401	0.138	476.041	7052.459	22920.281
15	3	0.497	63.802	1	945.219	4494.210	35.667	11.867	0.174	523.749	7759.244	30679.526
18		0.678	86.113	1	1275.752	4580.323	40.741	12.611	0.196	577.297	8552.548	39232.074
22	4	0.553	70.705	1	1047.483	4651.028	42.789	11.399	0.200	631.685	9358.296	48590.370
25		0.678	86.113	1	1275.752	4737.141	49.994	12.448	0.182	694.309	10286.059	58876.430
29	5	0.801	101.275	1	1500.369	4838.416	48.914	11.809	0.222	755.254	11188.948	70065.378
32		0.880	111.013	1	1644.635	4949.429	52.831	13.669	0.263	822.017	12178.030	82243.407
36	6	0.657	83.525	1	1237.403	5032.954	48.505	9.913	0.251	880.686	13047.197	95290.604
39		0.927	116.806	1	1730.464	5149.760	56.431	11.099	0.202	948.418	14050.634	109341.239
43	7	0.563	71.938	1	1065.745	5221.698	49.542	8.105	0.201	1006.266	14907.641	124248.880
46		0.591	75.389	1	1116.877	5297.087	55.036	9.540	0.241	1071.083	15867.893	140116.773
50	8	0.563	71.938	1	1065.745	5369.025	39.376	8.504	0.223	1119.186	16580.530	156697.304
53		0.902	113.725	1	1684.810	5482.749	46.584	9.301	0.251	1175.322	17412.175	174109.479
57	9	0.642	81.676	1	1210.011	5564.425	40.315	8.144	0.241	1224.022	18133.656	192243.135
60		0.790	99.919	1	1480.281	5664.344	42.560	8.078	0.261	1274.921	18887.716	211130.850
64	10	0.598	76.252	1	1129.660	5740.596	36.975	6.302	0.217	1318.415	19532.071	230662.921
67		0.534	68.363	1	1012.787	5808.959	36.903	5.837	0.190	1361.345	20168.071	250830.993
71	11	0.399	51.722	1	766.256	5860.682	31.962	5.072	0.186	1398.565	20719.479	271550.471
74		0.271	35.944	1	532.509	5896.626	344.648	5.226	0.174	1748.613	25905.375	297455.846
78	12	0.388	50.366	1	746.169	5946.992	27.540	4.865	0.195	1781.212	26388.323	323844.169
81		0.360	46.915	1	695.036	5993.907	30.617	4.503	0.215	1816.547	26911.804	350755.973

TKW-44

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.288	38.040	1	563.554	6031.947	30.141	4.357	0.183	1851.228	27425.597	378181.570
88		0.308	40.505	1	600.077	6072.452	30.725	4.298	0.199	1886.450	27947.404	406128.975
92	14	0.366	47.655	1	705.993	6120.107	31.971	4.084	0.229	1922.734	28484.945	434613.920
95		0.416	53.818	1	797.301	6173.925	38.241	4.243	0.195	1965.413	29117.227	463731.147
99	15	0.370	48.148	1	713.298	6222.072	20.657	3.500	0.189	1989.759	29477.908	493209.055
102		0.414	53.571	1	793.649	6275.644	15.336	3.501	0.187	2008.783	29759.745	522968.800
106	16	0.419	54.188	1	802.779	6329.831	41.661	3.392	0.107	2053.943	30428.782	553397.582
109		0.324	42.477	1	629.295	6372.309	14.454	3.474	0.197	2072.068	30697.301	584094.883
113	17	0.370	48.148	1	713.298	6420.456	12.130	3.145	0.186	2087.529	30926.353	615021.236
116		0.409	52.955	1	784.518	6473.411	12.380	3.606	0.213	2103.728	31166.338	646187.573
120	18	0.297	39.149	1	579.989	6512.560	10.007	3.291	0.229	2117.255	31366.738	677554.311
123		0.283	37.424	1	554.423	6549.984	9.512	1.076	0.061	2127.904	31524.501	709078.812
127	19	0.369	48.024	1	711.472	6598.008	7.694	2.965	0.208	2138.771	31685.493	740764.305
130		0.431	55.667	1	824.693	6653.675	8.227	3.370	0.215	2150.583	31860.486	772624.791
134	20	0.287	37.917	1	561.727	6691.592	6.471	2.925	0.211	2160.190	32002.812	804627.603
137		0.318	41.738	1	618.338	6733.330	6.083	3.157	0.229	2169.659	32143.093	836770.696
141	21	0.216	29.165	1	432.071	6762.494	5.168	2.843	0.210	2177.880	32264.886	869035.582
144		0.313	41.121	1	609.207	6803.616	4.740	2.657	0.232	2185.509	32377.908	901413.490
Initial conc.						1198.300	20499.900	357.900	0.000		20857.800	

TKW-46

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
1	1	0.714	90.551	1	1341.494	1341.494	4.276	3.532	0.040	7.848	116.267	116.267
4		0.239	32.000	1	474.072	1373.493	2.055	4.448	0.104	14.455	214.148	330.415
8	2	0.169	23.371	1	346.242	1396.865	0.658	0.592	0.001	15.706	232.681	563.096
11		0.150	21.029	1	311.545	1417.894	1.171	0.613	0.002	17.492	259.141	822.237
15	3	0.138	19.550	1	289.631	1437.444	0.534	0.368	0.000	18.394	272.504	1094.741
18		0.128	18.317	1	271.370	1455.762	0.361	0.294	0.000	19.049	282.207	1376.948
22	4	0.170	23.495	1	348.068	1479.256	0.737	1.041	0.011	20.838	308.711	1685.659
25		0.136	19.304	1	285.979	1498.560	0.496	0.528	0.000	21.862	323.881	2009.541
29	5	0.158	22.015	1	326.154	1520.575	0.661	0.264	0.000	22.787	337.585	2347.126
32		0.207	28.055	1	415.635	1548.631	0.715	0.137	0.000	23.639	350.207	2697.333
36	6	0.142	20.043	1	296.936	1568.674	0.686	0.139	0.000	24.464	362.430	3059.763
39		0.181	24.851	1	368.156	1593.524	0.889	0.116	0.000	25.469	377.319	3437.081
43	7	0.120	17.331	1	256.760	1610.856	2.236	0.003	0.000	27.708	410.489	3847.570
46		0.141	19.920	1	295.110	1630.775	1.566	1.056	0.019	30.349	449.615	4297.185
50	8	0.109	15.975	1	236.673	1646.751	1.482	2.224	0.054	34.109	505.319	4802.504
53		0.140	19.797	1	293.283	1666.548	1.275	2.232	0.060	37.676	558.163	5360.667
57	9	0.213	28.795	1	426.592	1695.343	2.174	5.433	0.151	45.434	673.096	6033.763
60		0.241	32.246	1	477.725	1727.589	1.105	1.999	0.060	48.598	719.970	6753.733
64	10	0.175	24.111	1	357.199	1751.700	1.410	2.606	0.064	52.678	780.415	7534.148
67		0.175	24.111	1	357.199	1775.811	1.294	2.436	0.062	56.470	836.593	8370.741
71	11	0.339	44.326	1	656.687	1820.137	1.814	3.796	0.104	62.184	921.244	9291.985
74		0.389	50.490	1	747.995	1870.627	1.424	3.484	0.090	67.182	995.289	10287.274
78	12	0.266	35.328	1	523.378	1905.955	0.589	2.492	0.063	70.326	1041.867	11329.141
81		0.220	29.658	1	439.375	1935.613	0.472	1.948	0.047	72.793	1078.415	12407.556

TKW-46

Days	Cycles	Absorbance	Oxidation product (sulfate concentration)				Neutralization Product					
			(mg/L/67.5g of waste rock)	Dilution (x)	(mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)	Ca	Mg	Mn	Sum (mg/L/67.5g of waste rock)	Sum (mg/L/kg of waste rock)	cumm (mg/L/kg of waste rock)
85	13	0.218	29.411	1	435.723	1965.024	0.398	1.814	0.044	75.049	1111.837	13519.393
88		0.281	37.177	1	550.771	2002.201	0.495	3.503	0.094	79.141	1172.459	14691.852
92	14	0.156	21.769	1	322.502	2023.970	0.239	1.427	0.032	80.839	1197.615	15889.467
95		0.229	30.767	1	455.811	2054.737	0.391	3.484	0.088	84.802	1256.326	17145.793
99	15	0.189	25.837	1	382.765	2080.574	0.180	1.484	0.035	86.501	1281.496	18427.289
102		0.253	33.726	1	499.638	2114.299	0.238	2.901	0.070	89.710	1329.037	19756.326
106	16	0.210	28.425	1	421.114	2142.725	1.271	1.604	0.036	92.621	1372.163	21128.489
109		0.215	29.042	1	430.245	2171.766	1.095	1.215	0.026	94.957	1406.770	22535.259
113	17	0.216	29.165	1	432.071	2200.931	1.184	1.609	0.040	97.790	1448.741	23984.000
116		0.342	44.696	1	662.166	2245.627	1.560	3.189	0.077	102.616	1520.237	25504.237
120	18	0.183	25.097	1	371.808	2270.724	1.367	1.790	0.034	105.807	1567.511	27071.748
123		0.158	22.015	1	326.154	2292.739	1.416	1.892	0.043	109.158	1617.156	28688.904
127	19	0.210	28.425	1	421.114	2321.165	1.338	1.635	0.036	112.167	1661.733	30350.637
130		0.201	27.316	1	404.679	2348.480	1.363	1.881	0.040	115.451	1710.385	32061.022
134	20	0.190	25.960	1	384.591	2374.440	1.416	2.129	0.053	119.049	1763.689	33824.711
137		0.214	28.918	1	428.419	2403.359	1.521	2.623	0.064	123.257	1826.030	35650.741
141	21	0.222	29.904	1	443.028	2433.263	1.256	1.846	0.043	126.402	1872.622	37523.363
144		0.178	24.481	1	362.677	2457.744	1.445	2.451	0.061	130.359	1931.244	39454.607
Initial conc.						1198.300	20499.900	357.900	0.000	20857.800		

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